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AN ELECTRICAL GYROSCOPE.

BY GEO. M. HOPKINS.

The gyroscope, though now a common toy and familiar to every one, is still a puzzle to scientists. It has been properly called the "mechanical paradox," for, while it depends on gravitation for its peculiar action, it appears indifferent to it.

To render the operation of the gyroscope as nearly continuous as possible, so that its movements may be more thoroughly studied, and to combine another influence with those that unite in the gyroscope of the common form to produce the almost miraculous phenomena exhibited by the instrument, I have applied electricity as a motive agent.

The gyroscope illustrated by the engraving has a weighted base piece, from which projects a pointed standard that supports the moving parts of the instrument. The frame, of which the electro-magnets form a part, has an arm in which is fastened an insulated cup, that rests upon the point of the standard. One terminal of the magnet coil is connected with this cup, and the other terminal is connected with the bar that connects the cores of the two magnets.

Upon the top of the magnet bar a current-breaking spring is supported by a hard rubber insulator, and is arranged to touch a small cylinder on the wheel spindle twice during each revolution of the wheel.

The wheel, whose plane of rotation is at right angles with the magnet cores, carries a soft iron armature, which turns very near the face of the magnet, but does not touch it. The armature is arranged in such relation to the contact surface of the current-breaking cylinder that twice during each revolution, as the armature nears the magnet cores, it is attracted, but immediately the armature comes directly opposite the face of the magnet cores, the current is broken, and the acquired momentum is sufficient to carry the wheel forward until the armature is again within the influence of the magnet.

The current-breaking spring is connected with a fine copper wire, that extends backward as far as the pointed standard, and is coiled several times to render it very flexible, and is finally bent downward so as to dip in mercury contained in an annular vulcanite cup placed on the pointed standard near the base piece.

The base piece is provided with two binding posts for receiving the battery wires. One of the binding posts is connected with the pointed standard, and the other communicates by a small wire with the mercury in the vulcanite cup.

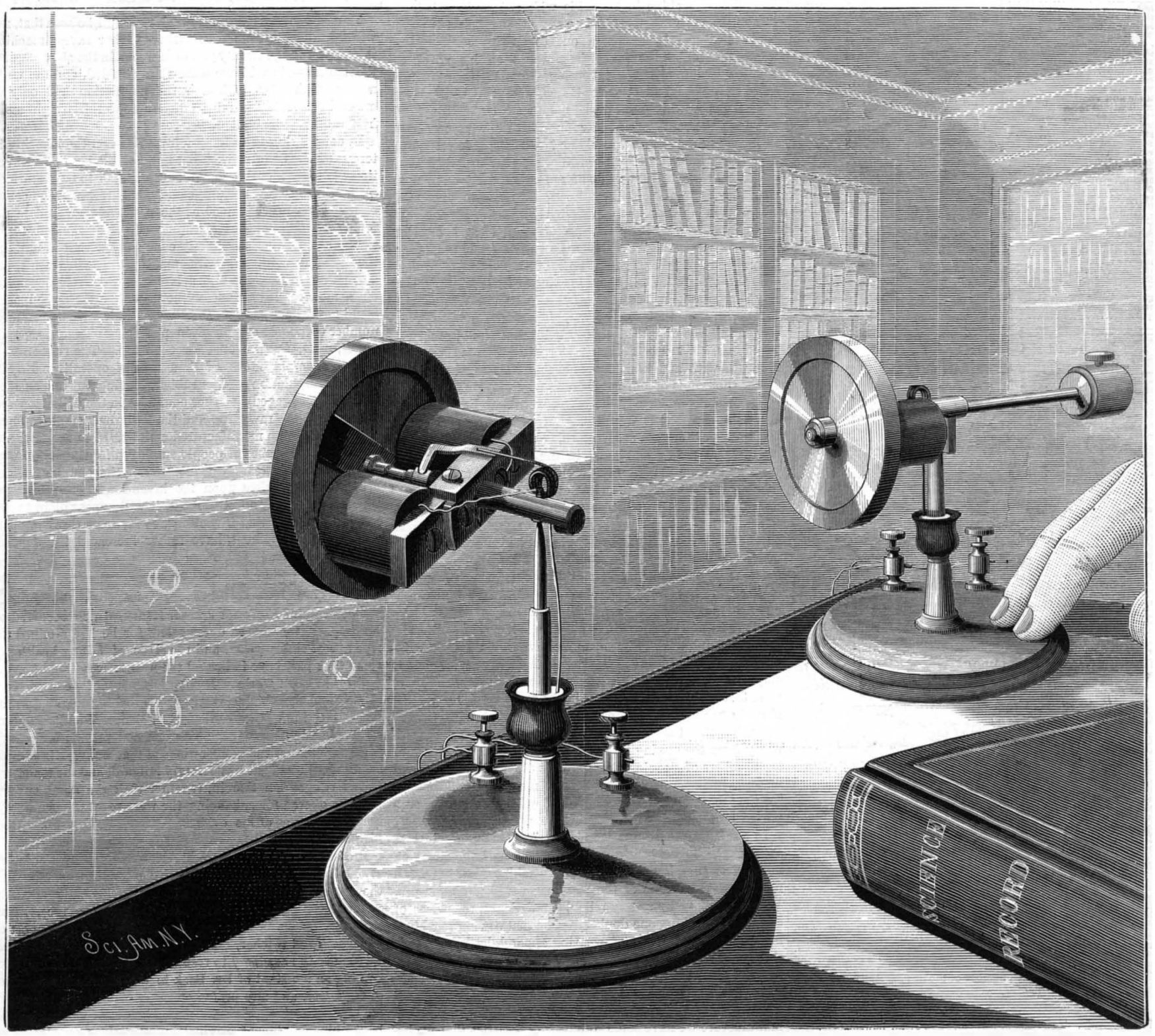
The magnets and wheel, and all of the connected parts, are free to move in any direction on the point of the standard. When two large or four small Bunsen cells are connected with the gyroscope, the wheel revolves with enormous velocity, and upon letting go of the magnets (an operation that requires some dexterity), the wheel sustains not only itself, but also the magnets and other parts between it and the point of the standard, in opposition to gravity. The wheel, besides rotating rapidly on its axis, sets up a slow rotation about the pointed standard in the direction in which the *under side* of the wheel is moving.

By attaching the arm and counter balance shown in the engraving, so as to exactly balance the wheel and magnets on the pointed standard, the whole remains stationary. By *overbalancing* the wheel and magnets, the rotation of the apparatus around the standard is in an opposite direction, or in the direction in which the *top* of the wheel is turning.

This gyroscope illustrates the persistency of a rotating body in maintaining its plane of rotation against the force of gravitation. It also exhibits the result of the combined action of two forces tending to produce rotations about two separate axes lying in the same plane.

The rotation of the wheel upon its axis, produced in this instance by the electro-magnet, and the tendency of the wheel to fall, or rotate in a vertical plane parallel with its axis, result in the rotation of the entire instrument upon a new axis, which is coincident with the pointed standard.

A MODE of equalizing the wear of the cylinders and pistons of horizontal engines, suggested by an English engineer, consists in making the piston-rod with a camber or upward bend, so that, when loaded with the weight of the piston and placed in the cylinder, it assumes a straight line, and transfers the weight to outside guides.



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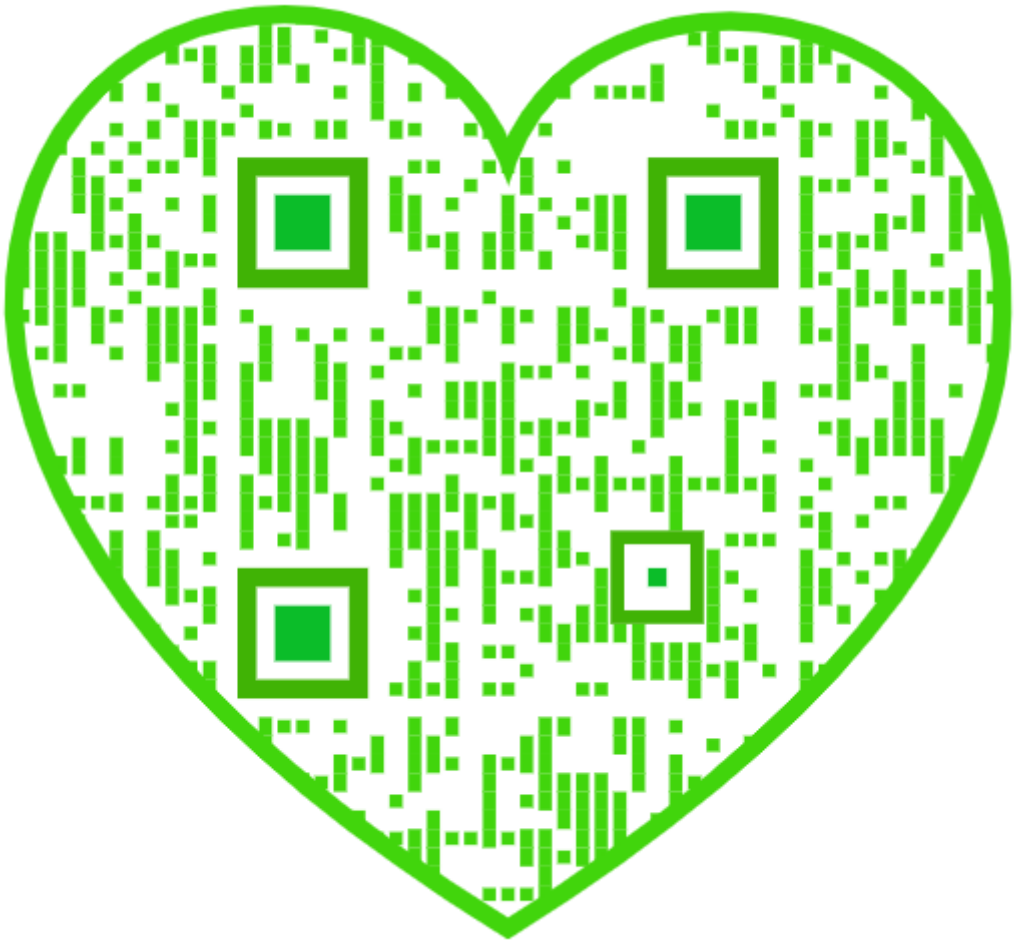

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DO INVENTIONS INJURE THE LABORER?

One of the arguments made use of by many against the patent law is the old fallacy that improvements in machinery take the bread out of the mouth of the laborer, and the great number of unemployed people at the present time is cited as an example of the effect of the use of machinery enabling one man to do the work of several, who must, it is stated, be thrown out of employment because the one man on the machine does all the work that the others did before. From this it is argued that a patent law for encouraging inventions is a bad law, and should be abolished.

This is one of the old ideas that are continually cropping up, and its fallacy has been so thoroughly exposed by the logic of events that it seems to many as hardly worth considering. We certainly thought so until lately, but it has made its appearance quite often of late in places where we would hardly have thought to have seen it. Petitions have been sent to Congress for the abolition of the patent law; various newspapers have been publishing articles condemning the introduction of new machinery, and seriously proposing a return to the old methods of hand labor, so as to give employment to the thousands who cannot now get it, and it appears from various questions asked by some of the members of the Congressional Committees on patents, in the recent discussion on the amendments to the patent law, that they are, or rather were, believers in this doctrine. We say "were," because we believe that since the discussion before these committees the members thereof have become so well posted on the good effected by patent laws that some of them, who were originally inimical to the law and seriously desired to repeal it or suspend its operation, are now in its favor. The fact, however, that men having sufficient general intelligence to edit a newspaper or to reach the position of members of Congress believe in the theory that machinery is hurtful to the laborer, seems to call for some effort on our part, as the special champion of the inventor and the patent law, to show how erroneous is this idea, and we therefore propose to cite a few instances that occur to us where it would appear that if there were any chances of machinery throwing people permanently out of employment, it certainly would be in the examples mentioned.

As one of the prominent and most familiar examples, let us consider the sewing machine. When Walter Hunt invented his machine in 1838, his wife objected to his introducing it, as she thought, like many others, "that it would throw all the sewing women out of employment." Hunt appeared to think the same himself, and on his wife's entreaties abandoned his invention, thus losing a fortune and leaving the field open to Howe, who was either wiser than Hunt on this point or had less scruples. Now what has been the result of the introduction of sewing machines in lessening the demand for labor? Are there fewer people now employed at sewing than there were formerly? Is it not a fact that the thousands of operators earn much more than they formerly could by hand; that where one stitch was put in a dress when made by hand there are ten now; that the miserable "three-stitches-to-the-inch" style of clothing has disappeared from the market since sewing machines have been introduced; that tens of thousands of women who formerly made the underclothing of their families, now buy it ready-made, because it is made so cheap by sewing machines; and that sewing machine made goods are exported in large quantities to countries that would otherwise supply us, because with their underpaid laborers they could compete with and undersell our manufacturers, and thus throw thousands of our people out of employment?

These statements may, however, be said to be mere assertions, not borne out by facts. Let us see, therefore, what the figures of the census say on this question. In 1850 there were 52,069 tailors employed in the United States, which then had a population of 23,191,876, or one tailor to 445 inhabitants. In 1870, notwithstanding the introduction and use of thousands of sewing machines, there were 106,679 tailors in a population of 38,558,371, or one to 361 inhabitants. So that although the population had not doubled by nearly eight millions, the number of tailors employed had more than doubled. The statistics relating to women's clothing are not so readily obtained, or we have no doubt but that they would show equally as well.

There is, however, another point to be considered. The introduction of the sewing machine has not been made without labor, for according to the census there were 17,372 hands employed in sewing machine factories in 1870, and there were 3,152 dealers in machines in the same year, besides the almost countless hosts of canvassers or "agents" who were perambulating the country, all of whom got their living directly from the sewing machine industry, to say nothing of the numbers of people who were employed in mining and manufacturing iron and steel for the machines and lumber for the tables, and the thousands of others indirectly supported by the sewing machine business.

In our remarks so far we have only cited such points as appeared to have a bearing on the question of the effect on labor of the employment of sewing machines, but have said nothing as to the gain of the people generally by their use. We do not have by us any reliable statistics on the prices of clothing, but if any one doubts the fact that sewing machines have reduced the price of wearing apparel, let him go to a shirt maker and ask the difference in the price that would be charged for making two shirts of the same materials, one to be made entirely by hand and the other by machine.

With regard to the effect of sewing machines on the shoe manufacture we have some interesting statistics that we believe may be relied on. The sewed shoes which are made in the greatest numbers are the ordinary gaiter shoes (women's). These shoes before machines were introduced for sewing them sold at about $2.00 per pair, but now shoes of the same quality can be bought for $1.50, notwithstanding that the materials in them have gone up from 40 to 70 per cent, and that wages have more than doubled. The women who formerly sewed the uppers got 50 cents per day; they now get $1.33 on the machine. Men got on an average $1.25 per day, varying according to their skill; now they get about $2.50—some rather less, many a great deal more.

If we consider the textile industries of cotton goods, woolens, worsted goods, carpets, hosiery, etc., we find that notwithstanding the great advance in the number of labor-saving inventions, the hands employed have increased faster than our population, and that the wages paid have more than doubled, as will be seen by the following figures, taken from page 596 of the Industry Volume of the Census of 1870:

	1860.	1870.
Hands	181,550	255,328
Wages.....	37,301,710	79,401,367
Product.....	196,416,400	395,158,565

The last line shows the advantage of the use of the improved machinery now employed, as, notwithstanding there was only an advance of less than one half of the number of hands employed, the value of the product was increased about 150 per cent, although the hours of labor in many factories were largely reduced between 1860 and 1870.

As another instance, take the use of the reaping and mowing machine. In the twelve States where these machines are used most we find that farmers and agricultural laborers have increased from 1,301,863 in 1850 to 2,024,399 in 1860, and 2,641,830 in 1870.

It may be objected, however, that most of the States where mowers and reapers are used are the rapidly growing Western States, and that this is therefore hardly a fair argument to use. We will therefore give the following table, compiled from the census, showing the hands employed in the various manufactories of all kinds all over the United States:

	Hands.	Wages.	Population.
1850....	958,079	$236,759,464	23,191,876
1860....	1,311,246	378,878,966	31,443,321
1870....	2,053,996	775,584,343	38,558,371

From a comparison of these tables it will be seen that, notwithstanding the immense number of labor saving machines introduced in the twenty years embraced in the above figures, the hands employed have more than doubled, and the wages nearly quadrupled, although the population had only increased from a little over twenty-three to thirty-eight and a half millions, or about 67 per cent.

In considering the effect of inventions on the laboring interests of the country we must not forget that many inventions actually increase the amount of labor to be performed, as, for instance, the telegraph and photograph. The census of 1870 gives nearly 17,000 as the number employed in different capacities in the telegraphic offices of the country, to say nothing of those indirectly connected with it in building the lines, drawing the wire, making the instruments, etc. The photographers are also a large class entirely dependent on a modern invention, without which their occupation could never have existed, and they in their turn keep a large number of people employed in preparing chemicals, paper, plates, mats, frames, etc., for their use. The rubber business also employs tens of thousands of operatives directly in the manipulation of the rubber, leaving out of consideration those engaged in other countries in the collection and shipping of the raw gum, and the thousands employed here in the sale of the manufactured articles. If to these we add the immense number of people employed in connection with the railroad and steamboat interests of the country, which are wholly dependent upon the inventions of the steam engine, locomotive, and steamboat, it will appear plain to the meanest capacity that inventions, so far from throwing people out of employment, have rather increased the demand for their services.

PROFESSOR JOSEPH HENRY.

The death of Professor Joseph Henry, which occurred on May 13, has not been unexpected, for he had attained the ripe age of eighty years, and the signs of failing health for some time past have indicated the near termination of a life fruitful in great works. During last winter he contracted a kidney malady which severely prostrated him, so that at the recent meeting of the Academy of Sciences, in Washington, he was barely able to leave his room and preside for a very brief period over the deliberations of that body. His address as president was read by Secretary Hilgard, and the tendering of his resignation therein, together with the many suggestions he offered for enhancing the welfare of the Academy, bore the impress of his evident foreboding that those were his parting words.

Professor Henry was born in Albany, N. Y., on December 17, 1797. His education was such as could be obtained at the ordinary common school, and he developed in his early years no especial aptitude for study. Entering the Albany Academy he acquired enough knowledge to fill the post of district school teacher, but this he did not retain long, returning to the academy to resume his studies, and finally becoming an assistant of Dr. Beck in the chemical researches of the latter, and also professor of mathematics in the above named institution. In 1826, while holding this position, he began his magnificent original investigations on electricity

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and magnetism, the first regular series on natural philosophy which had been prosecuted in this country since the days of Franklin. These researches gave him a wide reputation, and led to his call in 1832 to the chair of Natural Philosophy in the College of New Jersey, at Princeton. In 1846, at the organization of the Smithsonian Institution at Washington, Professor Henry was appointed its Secretary, which post he since constantly held. He was also one of the members of the Lighthouse Board of the United States, president of the National Academy of Sciences, besides a member of a large number of foreign learned societies.

It would require a volume to explain all of Professor Henry's investigations and discoveries in detail. The following, however, is a brief enumeration of the more important ones: First, a sketch of the topography of the State of New York; second, in connection with Dr. Beck and Simeon De Witt, the organization of the meteorological system of the State of New York; third, the development for the first time of magnetic power sufficient to sustain tons in weight in soft iron by a comparatively feeble galvanic current; fourth, the first application of electro-magnetism as a power to produce continued motion in a machine; fifth, an exposition of the method by which electro-magnetism might be employed in transmitting power to a distance, and the demonstration of the practicability of an electro-magnetic telegraph, which, without these discoveries, was impossible; sixth, the discovery of the induction of an electrical current in a long wire upon itself, or the means of increasing the intensity of a current by the use of a spiral conductor; seventh, the method of inducing a current of quantity from one of intensity, and *vice versa;* eighth, the discovery of currents of induction of different orders, and of the neutralization of the induction by the interposition of plates of metal; ninth, the discovery that the discharge of a Leyden jar consists of a series of oscillations backwards and forwards until equilibrium is restored; tenth, the induction of a current of electricity from lightning at a great distance, and proof that the discharge from a thunder-cloud also consists of a series of oscillations; eleventh, the oscillating condition of a lightning rod while transmitting a discharge of electricity from the clouds, causing it, though in perfect connection with the earth, to emit sparks of sufficient intensity to ignite combustible substances; twelfth, investigations on molecular attraction, as exhibited in liquids and in yielding and rigid solids, and an exposition on the theory of soap bubbles. These originated from his being called upon to investigate the causes of the bursting of the great gun on the United States steamer Princeton. Thirteenth, original experiments on and exposition of the principles of acoustics, as applied to churches and other public buildings; fourteenth, experiments on various instruments to be used as fog signals; fifteenth, a series of experiments on various illuminating materials for lighthouse use, and the introduction of lard oil for lighting the coasts of the United States; sixteenth, experiments on heat, in which the radiation from clouds and animals in distant fields was indicated by the thermo-electrical apparatus applied to a reflecting telescope; seventeenth, observations on the comparative temperature of the sun spots, and also of different portions of the sun's disk; eighteenth, proof that the radiant heat from a feebly luminous flame is also feeble, and that the increase of radiant light by the introduction of a solid substance into the flame of the compound blow-pipe is accompanied with an equivalent radiation of heat, and also that the increase of light and radiant heat in a flame of hydrogen, by the introduction of a solid substance, is attended with a diminution in the heating power of the flame itself; nineteenth, the reflection of heat from concave mirrors of ice and its application to the source of the heat derived from the moon; twentieth, observations in connection with Professor Alexander on the red flames on the border of the sun, as observed in the annular eclipse of 1838; twenty-first, experiments on the phosphorogenic ray of the sun, from which it is shown that this emanation is polarizable and refrangible, according to the same laws which govern light; twenty-second, on the penetration of the more fusible metals into those less readily melted while in a solid state.

In relation to the electro-magnetic telegraph, it has been clearly shown that Professor Henry was the originator of the only practicable method of sending telegraphic signals through long distances, and that he was the first to put into actual operation a telegraph of this kind. The inventions of Henry are all embodied in the Morse instrument, and if the former were to-day discarded it would be impossible, in a commercial sense, to send telegraph messages. Morse's instruments, on the other hand, might be withdrawn from use without serious difficulty. Indeed, the instrument upon which Morse most strenuously based his claims as originator of the telegraph, namely, the recording stylus, which produced a signal on paper, has already gone almost entirely out of use, and Henry's system of reading by sound is preferably employed. The honor of originating the telegraph undoubtedly belonged to Professor Henry, and had Congress, as it well might have done, granted him a patent for his inventions, although he never applied for this protection, at the time of his death he would have enjoyed a monopoly, as patentee, of all the telegraphs, railway signals, fire alarms, and electro-magnetic machines of every kind now in the United States, for he was the father of them all. It is hardly necessary to point out how enormously wealthy this would have made him, but he preferred to take his reward in the knowledge of having benefitted humanity, and in the enduring renown which posterity will accord to him.

MEDDLERS IN ARTS IN WHICH THEY ARE NOT SKILLED.

In his enumeration of the mischievous effects of the patent law as it now stands, before the House Committee on Patents, Mr. Raymond dwelt at some length on "a useless and pernicious class of patents," which the system encourages; namely, patents issued to "ignorant and officious meddlers in arts in which they are not skilled."

As a very bad case of such meddling Mr. Raymond pictured a backwoods Irishman, who, while taking his biennial trip along the railroad track to town, sees that some of the nuts attaching the fish plates of the rail are loose, and remembering that "the squire" made a great deal of money out of a patent, proceeds to invent a nut lock. We are to infer that a proper patent system would put a summary stop to this sort of foolishness. Here are some hundreds of skilled railway engineers and constructors, presumably competent to supply all the needs of a well regulated railway, and an unskilled Irish laborer steps in to instruct them in their art! Worse yet, he takes out a patent for his invention, so that if they should want to use his invention they must pay him a royalty therefor! Could anything be more atrocious, more oppressive to the high and mighty railway interest? And the influence of the patent law is to set every other man in the land studying over some device by which he can meddle in some art or other, regardless whether he is skilled in it or not. No wonder the advocate's mind revolts at it!

The mischief done by such meddlers is incalculable. Only the other day there was an art that had reached a marvelous stage of development. Some of the cleverest men of the century had been engaged upon it; and with a most scientific adjustment of reeds, organ pipes, bellows, diaphragms, and what not, they had succeeded in making a machine that could speak a number of words very distinctly. Then along comes a fellow, utterly unskilled in physiology, acoustics, organ making, and all that sort of thing, who takes a simple plate of sheet iron and makes it talk like a Christian. At one stroke a promising art is dashed to the ground, never to be revived. What chance had the most learned talking machine maker in competition with an unskilled meddler who could make a tin box cover imitate any sound that human ingenuity could bring before it?

There is another fellow, a teacher of deaf mutes, who has lately been meddling in an art in which he was not skilled. Already his uncalled for interference has had an enormous effect upon one of the most useful and flourishing enterprises of the age. He was not a telegrapher, not even an electrician; yet he has presumed to invade the domains of both those useful classes of the community. And the patent law encourages him! Curiously the first, though less successful, telephone maker was likewise a teacher, utterly unskilled in telegraphy and its kindred sciences. In this connection we might mention also that meddlesome portrait painter, Morse, who made such a revolution in the business of conveying intelligence, a generation or so ago.

Indeed it would seem that nine out of ten of the men who have contributed most to the progress of invention have been meddlers in arts in which they were not skilled. There was that early schoolmaster by the name of Whitney, who invented the cotton gin and revolutionized the agriculture of the South and the cotton manufactures of the North. He never raised a cotton plant in his life, nor did he ever weave an inch of cotton. Even more serious have been the effects of the agricultural meddlesomeness of another taker out of patents, McCormick by name, the inventor of the reaper. His interferences in arts in which he was not skilled, under the encouragement of our patent system, fairly mark an era in the history of his country. Under a patent system of Mr. Raymond's revising such things would not be allowed to happen.

Fulton was another meddler. In his day the business of transportation had become enormous for a new country, and the broad canvas of our shipping whitened every sea. What did he know about ship building? He never built so much as a canal boat. Yet he presumed to introduce a new order of naval architecture, a new method of propulsion, a new era in commerce. Not less unwarrantably meddlesome was Stephenson when he set his iron horse in motion. For many more than the hypothetical "coo" did the new engine threaten to be "verra bad;" and the Raymonds of the day had no lack of clients who deemed it an outrage that this man should be permitted to interfere in arts in which he was not skilled to the destruction of long established and prosperous industries. He had never owned or driven a passenger coach; nor had he any experience in the management of a wagon train.

A still earlier fruit of the English patent system was the steam engine of James Watt, whose influence has been felt in every art known to civilized man—in arts in which he was not merely unskilled, but which without him might never have been called into existence. Bessemer was another meddler—a bronze worker, who never made a pound of steel in his life until after he invented the process which revolutionized that important department of manufacture, making it possible to produce four tons of steel at what had been the cost of one.

We venture to say that Howe never so much as sewed on his own trowsers buttons before he began to make the first sewing machine; and everybody knows the results of his meddling.

So we might go on enumerating to the end of the chapter. The inventors of improvements in the means, methods, and appliances in general use are most commonly men skilled in the arts which they improve; not so the inventors of radically new means and processes. These as a rule are outsiders—meddlers, Mr. Raymond calls them; and a patent system which should bar them from patenting their inventions because they are not skilled in the arts which they seek to supersede or radically improve would shut off the most useful and productive outflow of inventive genius. It is true that these men are apt to be at the outset as poor as Mr. Raymond's Irishman. It is true, too, that the hope of making money is the chief inducement which leads them to patent their inventions. True also that such inventions often subject great interests to temporary inconvenience, and put a stop to profits arising from the use previously of satisfactory devices. Nevertheless the world gains enormously by them; and a people as intelligent as ours will not consciously favor any measure likely to debar or discourage the makers of such inventions, meddlers though they be in "arts," in which they are not skilled.

CLEARANCE AND COMPRESSION.

People used to understand by "clearance" only the distance between the piston and the cylinder head when the former stands at stroke end, it being necessary to allow a little such "clearance" at each end of the stroke to prevent possible accident in case the connecting rod brasses wore and let the piston make a slight overstroke. Later, when it came to be understood that "clearance" caused a difference in the working of the engine, the term began to be applied to the volume and not to the length of the space, and to include in addition the volume of the admission ports; so that now "clearance" in calculation means the whole volume between the piston at stroke end and the slide valve. The area of the space back of the piston is not cylindrical, nor that of the admission channel regular; but both may be measured by filling them up with shot or with water.

In calculating it is more convenient to express clearance in fractions of the piston displacement than in actual measures; thus it will run from, say, 0·02 up to 0·1, generally being least in large engines and in those having poppet or Corliss valves.

It is found convenient to prevent the exhaust steam escaping from the cylinder during the whole return stroke; but as the exhaust port is closed before the stroke end, there is steam on both sides of the advancing piston, which compresses the exhaust steam imprisoned until the clearance space contains steam sometimes of higher pressure than that in the boiler.

If there be no practical compression, the clearance space is, at the end of the return stroke, full of low pressure steam (of not more than 2 or 3 pounds per square inch), and the boiler steam rushes in and works on the piston about as though this exhaust steam were not present. But owing to the clearance the new steam does not do as much work as though the piston moved through the whole space. Often the cylinder steam is drier where there is clearance. But neglecting this and considering an expansive engine: If the clearance be $\frac{1}{10}$ and the cut off $\frac{1}{8}$, the rate of expansion will be

$$\frac{1\frac{1}{10}}{\frac{1}{10}+\frac{1}{8}} = 4\frac{8}{9}, \text{ instead of } \frac{1}{\frac{1}{8}} = 8.$$

Compression has very little influence on the rate of expansion, nor on the work done, but a good deal on the back pressure and on the steam consumption, and somewhat on the state of the steam. Thus, when the steam enters the partly empty clearance space it often gets drier, but where there is compression the amount of drying is less, especially when the clearance is full.

The cushion steam is first compressed by the piston until the stroke end (or near it if there be lead), at which the clearance spaces are filled with steam at the "cushion pressure;" then, if this cushion pressure is below that of the boiler, as is usual, the cushion steam is further compressed by the entrance of the fresh working steam from the boiler; thirdly, it enters the working space of the cylinder, and is generally cut off; it then continues to expand while doing work upon the piston; and fourthly, it suddenly expands, doing no work, except overcoming back pressure.

The working steam goes through all its changes nearly as though there was no clearance. The cushion steam goes through a series of changes without condensation.

Comparing two cylinders having the same total volume, but in one of which the piston stroke is shortened so as to give, say, $\frac{1}{16}$ clearance, and in which there is also compression, the ratio of expansion is the same; the mean forward pressure is independent of the compression, but is lessened by the clearance; the steam consumption is diminished $\frac{1}{16}$; the back pressure increased; the work done on the piston per pound of steam increased $\frac{1}{15}$; the useful work increased in a more complicated ratio, according to the amount of cushion; compression diminishing steam consumption, but also lessening the whole useful work done.

Calculation and experiment will adjust the amount of compression so as to reconcile small steam consumption and great useful work done.

It may generally be stated that there is always a loss by clearance, but that judicious compression reduces it to a minimum.

RICE GLUE.—The fine Japanese cement is made by mixing rice flour with a sufficient quantity of cold water, then boiling gently, with constant stirring.

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ASTRONOMICAL NOTES.

BY BERLIN H. WRIGHT.

PENN YAN, N. Y., Saturday, June 1, 1878.

The following calculations are adapted to the latitude of New York city, and are expressed in true or clock time, being for the date given in the caption when not otherwise stated.

PLANETS.

	H.M.		H.M.
Mercury rises	3 34 mo.	Jupiter in meridian	4 00 mo.
Venus rises	2 36 mo.	Saturn rises	1 24 mo.
Mars sets	10,00 eve.	Uranus sets	0 04 mo.
Jupiter rises	11 09 eve.	Neptune rises	3 02 mo.

FIRST MAGNITUDE STARS.

	H.M.		H.M.
Alpheratz rises	11 25 eve.	Regulus sets	0 08 mo.
Algol (var.) rises	1 13 mo.	Spica in meridian	8 37 eve.
7 stars (Pleiades) rises	3 33 mo.	Arcturus in meridian	9 28 eve.
Aldebaran rises	4 52 mo.	Antares in meridian	11 40 eve.
Capella sets	10 35 eve.	Vega in meridian	1 54 mo.
Rigel rises	8 54 eve.	Altair rises	8 34 eve.
Betelgeuse sets	7 33 eve.	Deneb in meridian	3 55 mo.
Sirius sets	6 59 eve.	Fomalhaut rises	2 13 mo.
Procyon sets	9 10 eve.		

REMARKS.

Twilight begins in the morning at 2h. 32m.; ends in the evening at 9h. 23m.; duration, two hours. The day is 14h. 53m. long, being 5h. 38m. longer than the shortest, and wanting only 13m. of the greatest length.

Mercury is at greatest western elongation June 2, and is brightest June 5, though probably he cannot be seen owing to the twilight. Mars, when first seen in the evening of June 3, will be about 1° south of the moon, and with Procyon in *Canis minor*, nearly south, and Betelgeuse in *Orion*, southwest, forms an isosceles triangle, the equal sides of which are 26°, and the base 19°. Venus and Neptune are in conjunction June 11, 3h. 18m. evening, Neptune being only 39′ north. At the time Venus rises (2h. 24m. morning, 12th) Neptune will be less than ½° west of her, and about the same distance north. For those who possess telescopes of sufficient power, this will be a favorable opportunity to look for this remote planet.

The Largest Electrotype ever Produced.

The Electro-metallurgical Company, of Brussels, has lately completed a colossal statue of Jan van Eyck, in bronze, by the system of electric deposition. The galvanic process occupied several months, although a thickness of but six to eight millimeters was attained. It is probably the largest object which has been produced by this method, being over twelve feet in height, and is regarded as a much more perfect imitation of the model than could be obtained by casting.

RUSSIAN TORPEDO BOATS.

The engraving, which we copy from the London *Graphic*, represents the new model torpedo boat, one hundred of which were recently ordered by the Russian Government. Each boat is 75 feet in length by 10 in breadth, with a draught of 5 feet, and a speed of 22 miles an hour. They are built of steel, and divided into numerous watertight compartments, which serve the double purpose of increasing their strength and preserving their buoyancy in the event of any injury resulting from the enemy's fire. The vessel is armed with three torpedo poles of hollow steel, one at the bow, and one on each side of the boat, and the torpedoes consist of steel or copper cases containing from 40 to 50 pounds of dynamite, which would be exploded by electricity, and which is considered to be sufficient to sink any vessel afloat.

THE EMPIRE DUSTLESS ASH SIFTER.

The invention herewith illustrated is a simple device for sifting ashes, the operation being easily and quickly performed without dust, leaving the coarse and fine material well separated In the upper part of the casing is a hopper, A, closed, as shown, by a hinged lid. Beneath the hopper is the sieve, B, which, by its handle, may be reciprocated back and forth. The upper lid, while the sifting is going on, is kept closed, and the slide, C, is folded up beside the side of the case, so that all the fine material falls down to the bottom of the latter into a receptacle placed to receive it. The slide, C, is then swung into the position shown in the illustration, and the sieve is dumped, the cinders then passing out into the scuttle, as shown.

THE EMPIRE DUSTLESS ASH SIFTER

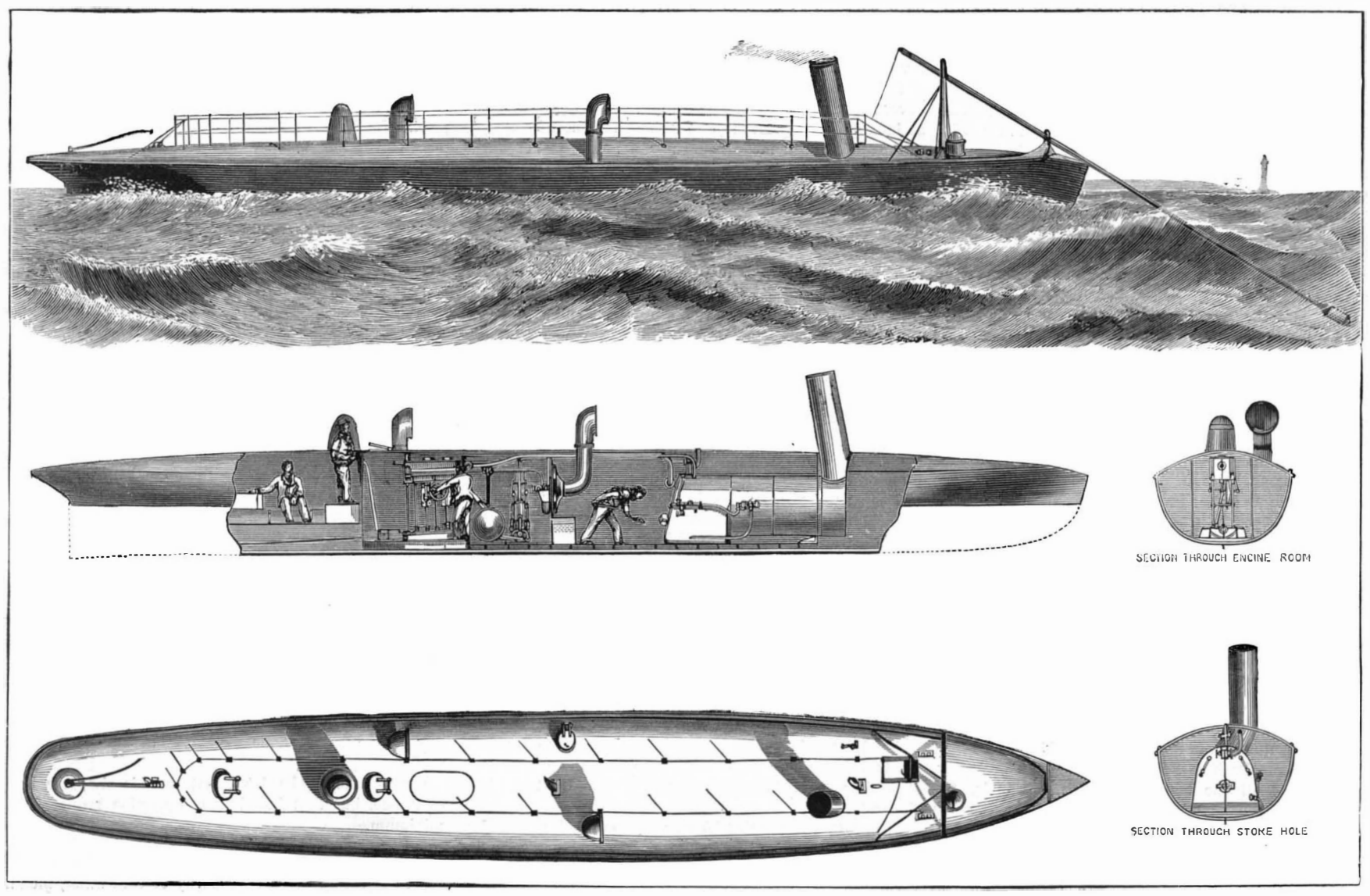
Patented through the Scientific American Patent Agency March 28, 1878. For further information address the inventor, Mr. J. E. Cumings, 7 Seymour Ave., Utica, N. Y.

The Importance of our Internal Commerce.

In a speech in defence of the system of protection, at Philadelphia, the other day, Senator Blaine paid a fitting tribute to our domestic commerce, the magnitude of which few appreciate. He said that while we have enjoyed the full benefit of protection to American industry against injurious competition from abroad, we have also enjoyed among ourselves the blessings of absolute free trade beyond that ever realized elsewhere by a population so large, over so vast an extent of country. With a broad land inhabited by a population that will soon be 50,000,000; with 15,000 miles of ocean front on the Atlantic, the Gulf, the Pacific, and the Arctic ocean; with five great interior seas, each more valuable than those waters for whose mastery European empires wage bloody and wasteful wars; with rivers connecting our States in a network of inland navigation greater than all the rivers of Europe combined; with railroads joining lake to Gulf and ocean to ocean—on all our ocean coast, on all our interior seas, on all our rivers, over all our railroads, between all our States, and with all our Territories, trade is absolutely free for all American products and fabrics, without fetter, or charge, or fee, or any governmental tax whatever, national, State, or municipal. And the great organic law of the land declares that it shall always remain so. The vast importance of our foreign commerce is now exciting the attention of the whole country. It has grown so large that its total for a single year amounts to nearly $1,200,000,000; but compared with our domestic commerce it is absolutely insignificant in extent. The traffic by railroad alone, in this country, is estimated to be sixteen times as large as our foreign commerce. And when we add to that the commerce of lake, and river, and canal, we have an aggregate which amounts to twenty-five times as much as our foreign commerce, including both exports and imports.

Silk Industry at Home and Abroad.

The annual report of the American Silk Association gives the total silk products of the country for 1877 as 1,177,504 lbs., the value of which was $21,411,436. The value of reeled silk consumed was $8,456,341, and of spun silk $850,000, making a total of silk threads to the value of $9,306,341. The silk consumed in sewings and twist, and in weaving, was worth $12,105,095. The imports of raw silk were 9,377 bales of 100 lbs. each, against 9,887 bales in 1875, and 1,249 bales in 1876. The production of raw silk throughout the world partially recovered last year from its great decline in 1876, but has not yet reached its previous average. According to the *Bulletin des Soies et des Soieries*, the total silk production for 1874 was 22,363,098 lbs.; in 1875 it was 21,161,313 lbs.; in 1876 it fell to 17,660,495 lbs.; rising again in 1877 to 18,791,855 lbs. The falling off took place almost wholly in France and Italy. In 1876, under the stimulus of high prices, the exports of Japan rose from an average of 14,000 bales to 20,000 bales. There was a marked increase last year in the number of bales exported from Japan direct to this country.



RUSSIAN STEEL TORPEDO BOAT.

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New Agricultural Inventions.

A combined Cultivator and Corn Planter, patented by Mr. J. Hamelback, of Hopewell, Ohio, is arranged to be used independently of the seed boxes as a simple cultivator or to act as a furrow opener for the seed. The seed boxes are placed in the rear of the cultivator teeth, are made detachable, and are applied to the rear slotted bar of the cultivator by supporting arms in connection with connecting rods and an operating crank shaft and lever.

Mr. B. F. Price, of Moline, Ill., has patented an improved Stump Extractor, which possesses among other advantages means for rapidly removing the stump after it is once started; an additional section to be applied to the end of the lever to increase its leverage when the power is not sufficient; and devices which adapt the chain to be fastened around a tree or object which will not allow the chain to be thrown over its top.

An improved Bale Tie has been invented by Mr. C. Battle, of Warrenton, Ga. The buckle is flat and T-shaped. Its broad end is provided with a slot having sharp or angular edges, to adapt it to receive and bite one end of the bale band, and the other end is bent upward and has lugs or projections for locking with the slotted free end of the band.

An improved Harrow, invented by Mr. G. Watt, Sr., of Richmond, Va., is formed of two flexible sections, which are connected and held apart by bars which allow independent motion. Each section is composed of toothed transverse bars connected by chains, the tension upon which, when the harrow is in use, serves to hold the teeth of the several bars at the proper angle. A heavy drag chain is attached to the rear toothed bars of the harrow sections for the double purpose of increasing the tension on the draught chains that connect the several bars, and pulverizing and smoothing the surface of the soil.

In a Plow invented by Mr. C. Koppenheffer, of Halifax, Pa., the improvement consists chiefly in constructing the beam of iron, and pivoting the same to an upward extension of the mould board, while its rear end is reduced in size, screw threaded, and bent around into a vertical position so as to be secured between two lips on the mould board by a nut screwed upon its end. The invention also consists in the peculiar means for adjusting the beam to the right or left.

Mr. H. Satterwhite, of Martinsville, Ind., has made an improvement in Toe Weights for regulating the gait of trotting horses. It consists in a metallic band having hooks at its extremities, which enter holes in the horse's hoof upon the sides, combined with a toe weight having two spurs at the bottom, which enter the horse's hoof at the front, the same being connected with said band, and the latter adjusted and tightened to hold the toe weight firmly to the hoof, independently of any connection with the shoe and without the use of an encompassing band encircling the rear and tender portion of the horse's hoof.

Mr. W. L. Freese, of Mohawk Village, Ohio, has invented a Grading Machine for making roads, banks, levees, etc. It consists of a series of scrapers actuated by ropes and working between side frames and a central frame or truck. Power is supplied by a steam engine on the middle truck, and communicated by means of ropes and pulleys.

An improved Seed Planter for corn, cotton, and other seed, has been invented by Mr. B. F Adams, of Burton, Texas. It is a frame with central front and side rear plows, carrying in slotted uprights a flanged seed box which moves vertically, and which may be raised, to interrupt the dropping of the seed, by means of a hand lever.

In a new Grain Separator, the invention of Mr. S. E. Adams, of Plain View, Minn., the object is to operate the shoe frame, which contains the grain sieves and screens, with minimum friction and less expenditure of power than heretofore. This is accomplished practically by means of a slotted arm or bracket attached to the side of the shoe, and a reciprocating bar operated by the fan shaft and having a stud.

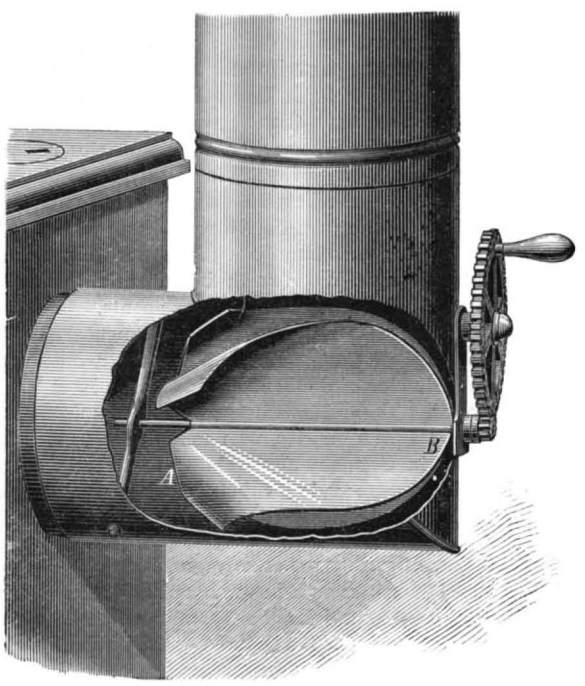
Mr. M. V. Dadisman, of Luray, Va., has invented a combined Grain Drill and Fertilizer, in which the arrangement is such as to secure the seeding of the grain, the fertilizing of the same, and the sowing of the grass seed, all in a single operation, or the performance of said processes singly, as may be desired. A number of improvements in the details of the machine are provided, to render it complete and efficient.

Mr. W. F. Senter, of Marshall, Mo., has invented a Marking and Dropping Attachment for Corn Planters which is claimed to insure planting in accurate check row, the seed dropper and the shaft of the marker wheel being connected by suitable mechanism, so that each time an arm of the latter comes into vertical position upon the ground the dropping slide is operated.

ANDREWS' DRAUGHT APPARATUS FOR STOVES.

The object of the invention herewith illustrated is to produce an artificial current of air to induce draught through the grate and fire pot of a stove, especially while a fire is being started. It is claimed to cure smoky stoves, and to aid combustion so rapidly that it is unnecessary to maintain a bright fire, except when the same is absolutely required for cooking or heating purposes.

The engraving exhibits the device in the stove pipe elbow, a portion of which is broken away to allow of its being seen. It consists of a suction fan at A, and blower fan at B, combined on a shaft, which has its bearing in a bar arranged across the pipe, and which is rapidly rotated by the



ANDREWS' DRAUGHT APPARATUS FOR STOVES.

crank and gearing shown outside the pipe. The suction fan draws in the air, and the blower portion forces it up the chimney. The apparatus may be applied either to the pipe, as shown, or to any other portion of the stove.

Patented January 22, 1878. For further information address the patentee and manufacturer, Mr. J. B. Andrews, 33 Broadway, New York.

Laryngostroboscopy.

Under this astonishing title, Dr. Oertel, of Munich, describes a method of observing the vibrations of the vocal cords during the production of sounds, from which considerable interesting and valuable information in regard to the physiology of the voice has resulted. The apparatus consists of a laryngoscope mirror, a strong light, and an arrangement by which the light shall be rapidly interrupted. The effect of the interruption of the light is to prevent the impressions made by the vibrations upon the retina from being modified before they can be perceived. The interruption may be conveniently produced by means of a perforated diaphragn revolving rapidly, and at a rate proportioned to the rapidity of the vibrations of the sounding cord; or it may be by a tuning fork of the proper note. The interrupting apparatus must be placed between the light and the mirror, or behind the mirror between it and the observer. By this means it is possible not merely to observe accurately the vibrations of one of the vocal cords, but also to compare the vibrations of one with those of the other.

How Kaga Ware is Made.

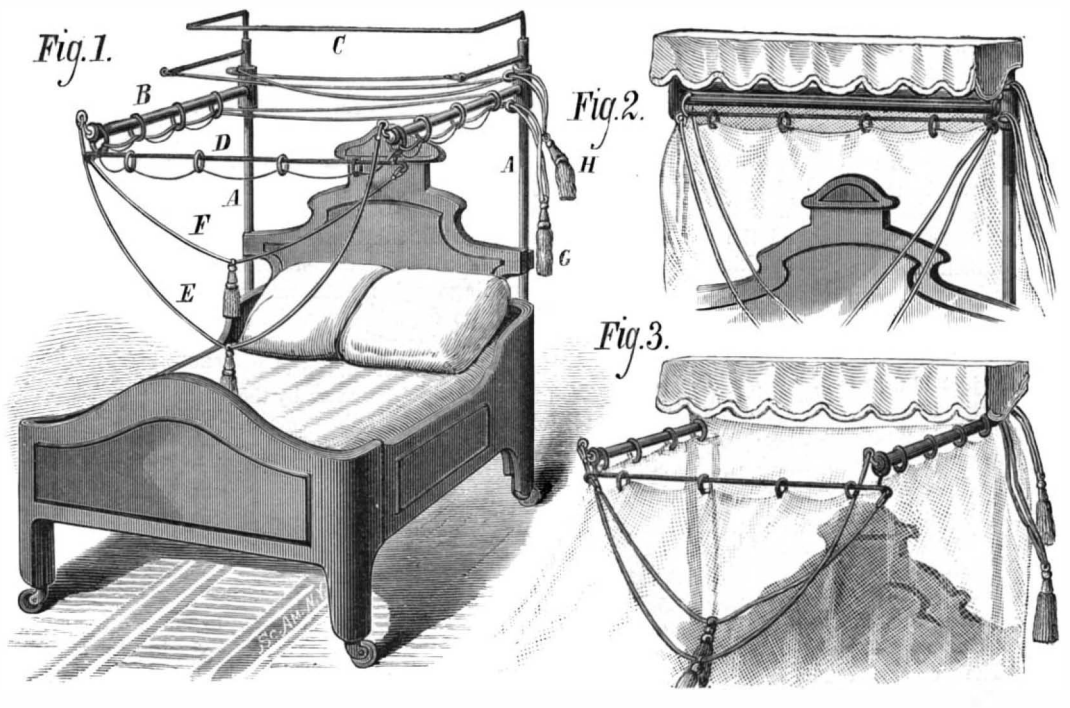
The decoration of Kaga ware is peculiar and easily recognized, being marked by a free and sometimes gaudy use of red and gold, and a lavish introduction of figures. A white stone porcelain is commonly used as a ground, though imitated Satsuma is in favor also. The products of the famous Kaga region have seldom undergone the dangers of transportation to the coast; consequently the name should be understood to apply to a style of ornamentation rather than to any geographical origin or distinguishing character of material. In this ware the red is first baked in, then the gold is added, and the porcelain again subjected to the fire. Finally the gold is burnished by a round metallic instrument, which brings out the luster wonderfully. A correspondent of the *Evening Post* found the appliances in the shop of a leading maker in Tokio to be curiously limited and rude. The painting is done in a small apartment, which, however, constitutes pretty much the whole house. The furnaces consist of two circular mud ovens, double, so as to allow a free circulation of hot air around the inner chamber, and of a size to admit but a very few pieces at once. During the baking, which takes several hours, an attendant feeds the fire with wood, the smoke of which, after considerable searching, finds a small hole in the roof through which to escape. It is a very simple family affair; the head of the house busying himself in what, if not the parlor, is the drawing room, while the wife and her kettles and the boy and ovens divide the kitchen between them. Yet in this quiet house of art some of the choicest Kaga ware to-day in Paris was made.

California vs. Australian Wool.

Formerly the greater part of the wool used in the knitting factories at Cohoes came from Australia. A few years ago samples of California wool were tried and found to be of superior quality, though so dirty that half the freight charges were paid for dirt. To remedy this defect large wool scouring establishments were opened in California, and ever since then they have been sending clean wool, saving not only half the cost of freight, but placing the Cohoes manufacturer in possession of a better article than Australia could furnish. As a natural consequence the Australian wool is now entirely discarded. Sheep raising is wonderfully increasing in Oregon, and the prospect is good that in a few years the Pacific coast will have a monopoly of the wool trade.

IMPROVED MOSQUITO NET FRAME.

The improved mosquito net frame herewith illustrated is so constructed that it may be extended over the bed or folded compactly as desired. It consists of two L shaped parts, composed of a vertical post, A, and horizontal arm, B. The posts are swiveled to the head of the bedstead, and their upper ends are connected by a rod, C. The arms are connected by the rod, D, which is attached by swiveled rings. To this rod and to the arms a mosquito net is attached by sliding rings which are connected by a rod. The cord, E, is secured to the ends of arms, B, for the purpose of swinging them forward and thus extending them parallel over the bed. When thus adjusted the rod, D, is drawn forward by the cord, F. The cord, G, serves to draw the rod, D, back, and by pulling the cord, H, which is attached to short lever arms, projecting from the tops of posts, A, the arms, B, may be swung or folded inward. The net, which is supported on the frame, may thus be extended, as shown in Fig. 3, or retracted, as in Fig. 2, either by the person occupying the bed or by one standing beside it. When folded it will be seen that the device occupies but very small space.



VOLLE'S MOSQUITO NET FRAME.

Patented through the Scientific American Patent Agency April 3, 1877. For further information relative to sale of rights, etc., address the inventor, Mr. Johann F. Volle, Houston, Texas.

A Mint for Honduras.

A complete mint, with all its appurtenances, will soon be shipped to Honduras from Philadelphia. The machinery, made by Howard, is of the finest description. In addition are sets of dies made at the United States mint. The order to American manufacturers was given agreeably to a resolution of the Government of Honduras providing for a national mint and assay office, the capacity of which will be at least $1,000,000 a year, or sufficient for all present requirements. A skilled assayer and machinist from the United States will go out to superintend the smelting of ores and the coinage, which conforms to the standard of this country.

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Communications.

Our Washington Correspondence.

To the Editor of the Scientific American:

The work of the Patent Office, as a result of the Commissioner's order to bring the work up to date, still continues large, the late issues being among the largest ever made, and that of the week before last being the largest that ever left the office, as it included 319 patents, 7 reissues, 13 designs, 46 trade marks, and 9 labels, or 394 in all.

As stated in a previous number of your paper, there was a proposition before Congress to reduce the salaries of the Patent Office examiners, which proposal has been defeated in the House, where it originated. It was shown that the salaries of these officers were originally fixed at the same as the judges in the United States District Courts, and that while the latter have had their salaries increased several times, the salaries of the examiners have remained the same. Although there may be a good reason for reducing salaries that were raised during the war or inflation periods, there is none for decreasing those which are at the same figure they were in 1860. In view of this the proposed reduction was voted down. The credit of the defeat of this attempt to reduce the efficiency of the Patent Office is due mainly to the Committee on Patents.

AGRICULTURAL DEPARTMENT.

The Commissioner of Agriculture recently received from Japan a shipment of silk worms, which are now being hatched for distribution in different sections of the country, where people are beginning to take an interest in this industry. In Silkville, Kansas, a French colony has been carrying on this industry for several years, shipping large quantities of eggs to foreign countries. The great difficulty in the way of this industry is the necessity of planting mulberry trees to furnish proper food for the worms. Professor Riley, however, has brought some worms from the West that thrive on the leaves of the Osage orange, used extensively in many regions for hedging purposes, and is breeding a quantity for distribution. This change of food will no doubt lead to a more extensive introduction of silk worms, as the leaves of the Osage orange can be readily obtained in almost any district, while the mulberry leaves are comparatively scarce.

The Commissioner has been for several months past devoting considerable attention to the growth of the tea plant, and a few days since had a party of gentlemen at the department to taste tea made from leaves gathered from plants grown in South Carolina. The plants were transplanted in pots from their place of growth to the hothouses in the Agricultural grounds. The leaves were plucked and dried over a slow fire in the laboratory, and then subjected to the usual steeping process, which resulted in producing excellent tea. Two gentlemen were present, representing a Baltimore tea warehouse, who had spent six years in the tea-growing district of China, and are well informed as to the cultivation of the plant and process of curing the leaves. They expressed their firm conviction that there was no doubt of the possibility of tea culture being as successful as corn growing, if the cultivation be confined to the Southern States. The experiments seem to demonstrate it, so far as the quality of the article is concerned, for a wholesale grocer in this city is willing to give a dollar a pound for the native tea, which he considers as good at least as any imported into this country. It is possible, however, that the mere growing of the tea is not all that is necessary to make a practical commercial success of this project, but that the gathering and curing of the leaves may be the sticking point, in which case there will be a chance for our inventors to try their hands or their brains to overcome what may be the main trouble in raising our own tea.

OPERATIONS OF THE FISH COMMISSION.

The United States steamer Lookout has just finished "planting" about 600,000 young shad in the Potomac. The eggs for these were gathered in the Albemarle Sound by the Fish Commission, and when the vessel started it contained about 800,000 eggs, but at Norfolk a fresh supply of water was introduced into the hatching machine, and owing to something in the water, large numbers of the eggs were spoiled. The hatching process consumes from three to five days, and by the time the vessel had reached Fort Washington, the shad were about three inches long. After this the planting began, and was continued up the river until the vessel stopped at the wharf in this city. The process of "planting" is a very easy one, and is equivalent to the scriptural injunction to "cast thy bread upon the waters" in the hopes of finding it "after many days." It consists simply in lowering cans containing the young fish down into the water at the side of the vessel and allowing their contents to escape.

The Commission has received information that out of the 1,000,000 eggs of the California salmon supplied to New Zealand, at the expense of the colonial government, over 95 per cent of live fish was obtained, which is the more satisfactory because the New Zealanders had spent thousands of pounds sterling in the endeavor to stock their rivers with European salmon. Information has also been received from Georgia that shad have become plentiful in the rivers of that State, in consequence of the operations of the Commission in that region, and shad are now hawked about the streets of Northern Georgia at from 6 to 8 cents per pound, instead of 25 cents per pound as formerly.

A NARROW GAUGE ROAD TO THE WEST.

The House Committee on Railroads are about to report favorably on the bill granting a charter to the Washington, Cincinnati, and St. Louis Narrow Gauge Railroad Company. This road is already begun, about fifty miles being graded in Virginia. The promoters assert that a road of three feet gauge can be built and operated for less than one half of the standard gauge roads; and that therefore they can largely reduce the expenses of transportation between the West and the Atlantic seaboard. The company proposes to run a line of freight steamers from Washington to New York to connect with its road. It also proposes to establish branches to Chicago, and gradually to extend a narrow gauge railroad to all important points both East and West. One of the great advantages claimed for this road is that it will open up the West Virginia coal fields, which are said to yield a coal that will test 40 per cent higher for gas making purposes than any coal produced in Pennsylvania.

A PAPER AND STATIONARY EXHIBITION.

The Department of State has received information through Consul-General Kreismann that a general international exhibition of paper and stationary, and the industries pertaining thereto, will be held at Berlin from July 10 to August 31 of this year. It is believed that the opportunity is a good one for exhibiting the excellence of our products in this field, and American manufacturers are cordially invited to contribute. Messrs. Woodworth & Graham of your city have intimated their willingness to act as agents.

Mr. Kreismann also informs the department that the Prussian Minister of Commerce has addressed a communication to the Director of the School of Mines in New York, to the effect that those American engineers of mining and smelting works and foundries, who may desire to visit the establishments in Germany appertaining to their business will find arrangements made for their information and guidance at the Royal Academy of Mines, No. 6 Liestgarten, Berlin.

THE CHINESE LABOR QUESTION.

The House Committee on Education and Labor has agreed upon a bill as a substitute for the several pending bills "to restrict the immigration of the Chinese to the United States." The bill makes it a misdemeanor for the master of any vessel to take on board at any foreign port whatever any number exceeding fifteen Chinese passengers, whether male or female, with the intent to bring such passengers to the United States; and provides that the act shall take effect from and after January 1, 1879.

The Senate Committee on Foreign Relations has decided to recommend the adoption of a concurrent resolution, taking the ground that the treaty provisions which allow unrestricted Chinese immigration to this country might be wisely modified, and inviting the attention of the President of the United States to the subject. This resolution is a substitute for Senator Sargent's joint resolution providing in express terms that the President should be requested to open negotiations with the Chinese Government with the view to restrict the immigration of its subjects to this country.

Washington, D. C. R.

Driving Piles in Sand.

To the Editor of the Scientific American:

In regard to the paragraph under this caption on page 274, SCIENTIFIC AMERICAN of May 4, 1878, I would respectfully call your attention to the fact that the method employed by the French engineers—that of sinking a tube alongside the pile and forcing a stream of water through it—was used in this country at least fifteen years ago, by the Confederate engineer in charge of the defense of Mobile Bay. I witnessed the operation first in 1863, when the Confederates were sinking a line of piles across the channel between Forts Morgan and Gaines. The pumping engine used was a steamer belonging to the Mobile fire department, and the rapidity with which the huge yellow pine piles were sunk in the hard, sharp sand was something wonderful, especially after witnessing the futile efforts made to drive them by the old fashioned pile driver. I do not remember the name of the engineer, or of the deviser of the plan, which was then thought to be entirely original (and probably was so), but think it was Gen. Ledbetter.

Osceola, Ark., May 5, 1878. F. L. JAMES, M.D.

An Egg within an Egg.

To the Editor of the Scientific American:

I have a hen that produced an egg in March last that measured 6½ inches in circumference (largest part of bulge), and in the same month produced another measuring 6⅝ inches. The following month the same hen laid another egg measuring 7⅛ inches, which weighed 4½ ounces. When this was broken it was found to contain another naturally formed egg with shell complete. The space between the two shells was filled with ordinary white of egg. The outer shell was quite thin. The hen is of common breed.

P. C. MIXTER.

An Organized Patrol for Tramps.

The tramp element having become altogether too bold and lawless in Omaha, an organized vigilance committee of trusty citizens has been sworn in as special policemen by the Mayor, to serve without pay, until the city is thoroughly rid of tramps. The plan adopted was to surround the city at night with two or three hundred resolute men assisted by policemen, and to work inward, arresting all vagrants and suspicious or criminal characters to be found. This action is to be continued until the pests are entirely rooted out.

Yankee Notions.

The industrial importance of small manufactures is appreciated by few. In New England especially the making of "Yankee notions" has formed, and still forms, a very essential element of the national prosperity. Said a prominent Eastern manufacturer the other day to a *Herald* correspondent, "New England has invested a great deal of capital in her leading manufactures, yet her real strength lies in the numerous small things in which she stands unequaled. So many things are required in our civilization that the absence of the very smallest of these 'notions' would be missed by thousands, both here and abroad, now accustomed to their use. Take this little tag, for instance, which costs hardly anything; study its manufacture, its demands, and you will readily see the importance of such articles in the country's industry."

The reporter visited the maker of the tags, and found him busy with correspondence, including a cable order from London and letters from Buenos Ayres, Havana, and Rio Janeiro, received that morning. A visit to the factory discovered an entire brick building where the cardboard was smoothed and enameled by heavy machinery, and floor after floor was devoted to drying, cutting, packing, and pointing, with any number of men and women employed, all for the purpose of producing the tag which one sees dangling from a trunk or a valise. The cutting and eyeletting machines do their own counting, dividing the tags into packages of fifty, as they are dropped into boxes, and ringing their own alarm if one of the little metal rings obstructs the free passage of others. After seeing the employment of so many people and such powerful machinery in the production of an article so simple and cheap, the reporter began to think that the importance claimed for the "notion" industry was not so exaggerated as he had thought. The thousands of establishments of this sort scattered over the land are so many illustrations of the advantages of a cheap patent system. Every one of them is founded on one or more simple inventions, few of which would ever have been made or could have been made the basis of a profitable business under a system less favorable to inventors than ours.

Another Triumph for American Inventors.

Up to 1855 this country depended entirely on England for medium and fine knit goods. Now thanks to our improved machinery we make as fine knit goods as England, and excel her in all the cheaper grades. Said Mr. Root, a prominent manufacturer of Cohoes, to a correspondent of the *Herald*, "Importers of English goods now find themselves compelled to take our goods, the style and finish being preferable and the quality superior in regard to the majority of grades." To-day Cohoes manufactures half the merino shirts and drawers worn in the country. The importations from England grow less and less every year. Said Mr. Root: "We have virtually driven English goods out of the market, and, what is more, we are constantly improving on our own manufactures. Of the knit goods heretofore made two thirds were for men and one third were for ladies, simply because the latter could not wear the coarser goods we were then making. Now one half of the knit goods—$5,000,000 worth—manufactured annually in the United States are fit to be worn by ladies, the physicians having generally commended their use throughout the country. A small quantity of the finer grades of gauze goods is still imported, since England can afford to spend more manual labor upon them. The manufacturers of Cohoes have faith in machinery, and have relied for success mainly on its improvement.

Competition in Cutlery.

In 1834 all the table cutlery used in this country was imported from England. To-day English goods in this line have been driven out of the American market, only small exceptional parcels being imported. In fact, out of an annual consumption amounting to not less than $2,500,000 worth, not more than 8 per cent comes from England. The home market being secured, the trade is steadily extending into foreign markets, notwithstanding the fact that American cutlery is dearer than Sheffield articles: this on account of their superior shape and finish. Said Mr. Oakman, the treasurer of the Russell Cutlery Company, to a correspondent of the *Herald:* "The time is coming when we will beat England also in prices; almost every day we study to make our knives cheaper. If we can only succeed in reducing the cost half a cent per dozen a day, we are satisfied; but we must keep steadily at it. Still we have already done pretty well. Take, for instance, this solid handled steel table knife, which we sold for $5 a dozen in 1867, we now sell for $1.25 a dozen; and this is the way, if we want to compete." American cutlery now goes largely to Australia, South America, and Europe. We are pushing England also in pocket cutlery. Of the two million dollars' worth of pocket knives sold here every year, England supplies only one million dollars' worth, while not many years ago nobody would look at anything but an English knife. The extent to which machinery has been made to take the place of manual labor is the great secret of our success in the manufacture of cutlery. The cutting of the wood for the handles, the finishing of the ivory the cutting of the steel, the shaping of the knife, the fastening of the handle, the designing of the ornamental handles, the grinding, the finishing of the blade, and numerous other minutiæ, are all done by machinery, most of which is also made in the works.

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NOTES ON THE TELEPHONE.

BY L. L. DUERDEN.

When an iron armature approaches the poles of a permanent magnet on which insulated wire is wound, a current of electricity is thereby induced, and flows in one direction through the insulated wire; and when the armature is moved from the poles of the magnet a similar current flows through the wire, but in a reverse direction; and conversely, if the currents thus produced be passed through insulated wire wound on another permanent magnet, the armature of the second magnet will move in the same time as the first, but not necessarily in the same relative direction, as that will depend on the relative polarity of the magnets.

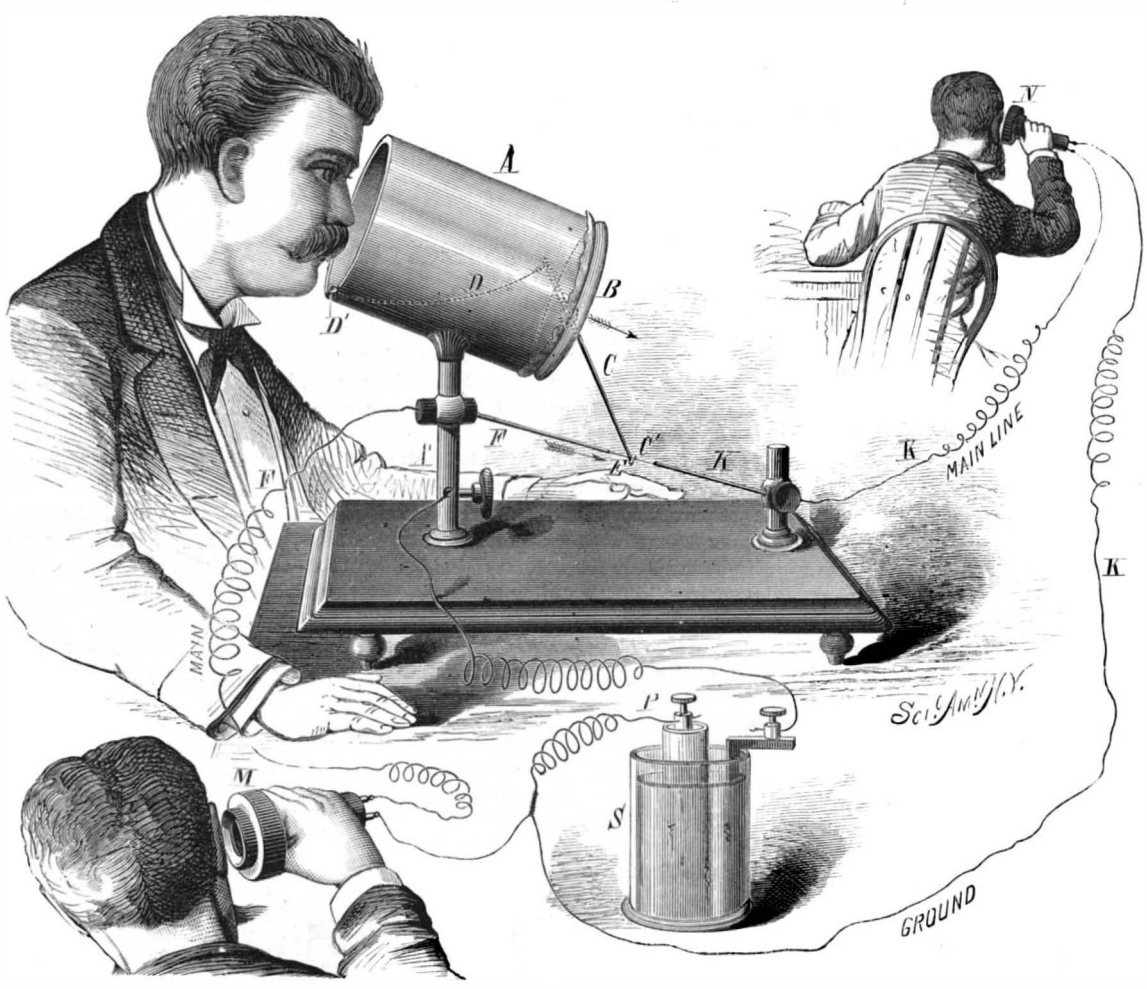
In the Bell telephone, the iron diaphragm which serves as an armature is caused to move directly to and from its permanent magnet, by minute concussions of air, from the speaker's throat. As these concussions are necessarily limited in their ability to move the diaphragm, it follows that if the slight movement thus produced could be used to properly control a power (in the same manner as the slight movement of the slide valve of a steam engine controls the admission of steam to its cylinder), instead of directly producing it, a much more powerful telephonic result could be obtained.

With this object in view, after several experiments, I constructed a transmitter on the principle shown in the engraving, in which A represents a metal speaking tube, having a membrane, B, of gold beater's skin, in the center of which the sewing needle, C (metallically connected to the fine wire, D, which is soldered, at D′, to the speaking tube, A), is secured by sealing wax. The end, C′, of the needle is hooked, so as to clip the short piece of very fine platinum wire, E. One pole of the galvanic cell, S, is connected with the metallic post, A′, to which the speaking tube, A, is soldered, whereby the end, C′, of the needle becomes the negative terminal of the battery, S; and the positive pole, P, has two wires, F and K, connected with it; the wire, F, leading through the telephone, M, to one end of the platinum wire, E, and the wire, K, leading through the telephone, N, to the other end of the wire, E.

By this arrangement there are two courses open to the galvanic current from the end, C′, of the needle to the positive pole of the battery, S; and when the resistance of each course is the same, the current divides itself equally between the two; but as the platinum wire, E, has great resistance to the current, the least movement, in either direction of its arrow, of the end, C′, of the needle, will make the course towards which it moves the one of the least resistance, and the same movement increases the resistance of the other course; so that the relative difference in the resistance of the courses appears to be in proportion to the square of the resistance that is thus produced by the movement of the hooked end, C′, of the needle.

Now the voice of the person who is speaking at the mouth of the tube, A, causes the membrane, B, to move to and fro in either direction of its arrow, and the length and speed of these movements differ as different words are uttered; and as the needle, C, is rigidly secured to the membrane, B, by sealing wax, its end, C′, copies the length and speed of the movements of the membrane, and by like movements in either direction of its arrow directs a current to the wires, F or K, which corresponds in power to the varying length of these movements. The wire, E, should be stretched, and the hooked end, C′, must have an upward tendency, so as to keep it in uniform contact with the wire, E.

The instrument as above described serves simply as a transmitter, and by careful adjustment at C′, and speaking in an undertone, the sounds through the telephones, M N, were almost articulate. Singing in an ordinary tone would break contact at C′; but the results obtained were sufficient to encourage the construction of another instrument, and if better results are obtained I shall be happy to describe it.



NEW DETAILS OF TELEPHONE ARRANGEMENT.

Two Remarkable Accidents.

In the transactions of the Medical Society of New Jersey, for 1877, Dr. Ryerson reports the case of a child which lived four weeks with over an inch of No. 1 sewing needle in the heart. Search for the needle before death was unsuccessful. At the autopsy it was found to have passed partially through the cartilage of the fourth rib, into the wall of the right ventricle. Pus welled up through the perforated cartilage, and loose in an abscess holding an ounce or more of pus, in the muscular substance, lay the needle. It was supposed that until loosened by suppuration the broken end of the needle remained fixed in the rib, thus pinning the heart to the chest wall.

A still more remarkable accident, with recovery, is reported in the Transactions of the Medical Society of Pennsylvania, for the same year. In this case a boy of fourteen was impaled on the end of a carriage shaft, the point of the shaft entering one inch below the left nipple and coming out at the back. The victim was swung three times into the air by the rearing of the horses, then pushed himself off, and walked home with some assistance. No cough or hemoptysis followed and apparently little shock. Effusion into the pleura occurred with discharge of pus, front and back. This gradually lessened, and finally both wounds closed, the one in the breast last. The boy has recovered robust health.

New Mechanical Inventions.

An improved Link Motion has been patented by Mr. S. Hamblin, of Greenville, Pa. The arrangement permits adjusting the link of a reversible engine by means of a cord, and also clamping the link in any desired position, so that the engine may be run with the operating valve at less than a full stroke.

Mr. S. M. Moore, of Canastota, N. Y., has patented an improved system of Manufacturing Knife Blades, by means of trip or drop hammers, driven by any power, from rod steel, and in such a manner that the grain of the steel, it is claimed, will not be injured at the junction of the blade and tang, thus remedying a defect common in knives produced by hand forging. A series of peculiarly shaped dies and hammer heads is employed to accomplish this.

An improvement in Mill Stone Drivers, made by Mr. D. T. Staples, of Galt's Mills, Va., consists in connecting the driver with the stone by a collar having seats for the driver, which collar is located in a frame rigidly fixed in the top of the stone, and is supported upon diametrical lugs, which enter recesses in the frame and cause the stone to turn with the driver. These lugs allow the collar to oscillate slightly, to cause both ends of the driver to bear against the same.

Mr. R. D. Mossman, of Bristol, N. H., has invented an improved Machine for making Wood Pulp for Paper. It has a grindstone in whose face there are diagonal grooves filled with corundum, the stone being mounted on a vertical shaft and inclosed in a curb. In opposite sides of the latter are adjustable pockets for containing the wooden blocks from which the paper pulp is made.

A novel Steam Engine, invented by Mr. T. A. Henderson, of Natchez, Miss., is of that class of engines in which the function of the steam cylinder is performed by a bellows-shaped expansible and collapsible vessel. In Mr. Henderson's engine there are two such vessels, provided with a slide valve and suitable connecting and operating mechanism.

A convenient machine for Turning and Eyeletting Cases for umbrellas, fishing rods, etc., has been patented by Mr. W. Harnah, of New York city. A hollow cone, heated by a warm water circulation so as to soften the material, receives the cases, wrong side out. It has a round tenon at its smaller end, to receive the eyelet, which is applied by a hollow follower operated by a lever. The end of the case being tied, the case is readily turned, and the operation completed.

An improved Adding Machine has been invented by Mr. W. W. Hopkins, of Thorntown, Ind. The elements of the machine are, first, two series of notched wheels bearing numbers on their periphery; second, a corresponding series of endless chains mounted on the wheels; third, a box having the nine digits and the cipher inscribed in parallel rows on one of its sides, which is designated the counting table. The chains travel over the counting table on lines coincident with the rows of digits. The several chains and rows of digits correspond to the units, hundreds, and thousands columns of the figures to be added or subtracted, etc. The machine is operated by moving the chains successively downward the length of the distance of each number to be added, etc.

Mr. C. E. Patterson, of Wellsboro, Pa., has invented an improved Machine for Calculating Interest, difference between dates, price of articles measured by pound or yard, and performing various other mathematical problems. The machine is compact, being a circular box about four inches in diameter and two inches in depth. The movable parts are an annular plate and a traveling apron which winds on or off two rollers.

Mr. P. C. Close, of Augusta, Ga., has invented a Burglar-Proof Blind Hinge, which he claims can only be turned from the inside by a system of worm wheel gearing operated by a crank, the mechanical devices being original and efficient.

In a Stone Sawing Machine invented by Mr. W. Tuggey, of West Rutland, Vt., the patentee provides improved means for operating all the grippers simultaneously, for the purpose of releasing them from their bite on the guide rods, so as to enable the gang of saws to be raised quickly when their work is done.

Mr. P. Langlois, of Port Henry, N. Y., has patented a Sewing Machine having an improved set of feeding devices adapted to secure a more positive and uniform feed, and to permit the better turning of the work. A swiveling feed step is located upon a peculiarly constructed four-motioned feed having positive movement in every direction.

A simple Horse Power, invented by Mr. C. E. Macarthy, of Forsyth, Ga., is made by arranging upon the vertical king post, to which the sweep is attached, a large horizontal grooved pulley, and in combining with the same an endless rope or belt, which is wrapped once around the horizontal pulley, and is then passed around a vertical speed pulley upon one side of the king post, and then around a vertical tension pulley upon the other side.

Mr. J. Grubs, of Lickingville, Pa., has invented an improved Drill Bit for drilling oil, salt, and artesian wells. In drilling such wells the usual practice has been to first run down a small bit (termed a "center bit"), and then enlarge the hole by means of a reamer. This drill enables the same result to be produced at one operation, and therefore combines the functions of both bit and reamer. The drill has acute angled points or side cutters and a concave cutting edge extending transversely between said points.

How America Crowds England.

In giving his impressions of America in a leading English periodical, a recent English visitor remarks that the Russo-Turkish war ought to have shown the American manufacturers that they have little reason to fear the English. So far as he had been able to learn not a single cartridge had been made in Birmingham for either Russia or Turkey; but when he was in Bridgeport, the cartridge factories had been running day and night for months, and he saw a Russian and a Turkish commissioner in the same works. The fact was the Americans had made the rifles as well as the cartridges for both combatants. As further evidence of the threatened supremacy of American manufacturers he noted the fact that Lowell was sending cotton cloths to Manchester, and that in our retail stores cotton goods were marked at a lower price than that at which goods of the same quality could be sold at Liverpool or London. "It is the same," he said, "with the other manufacturing industries of America. The manufacturers of hardware are beating us in market after market from Hamburg to Melbourne. In Birmingham itself the merchants are importing from the United States such articles as axes, hay forks, and agricultural implements of nearly every description, sash pulleys, and small castings of very many kinds, although it is estimated that freight and other expenses add 17 or 18 per cent to the cost of the goods."

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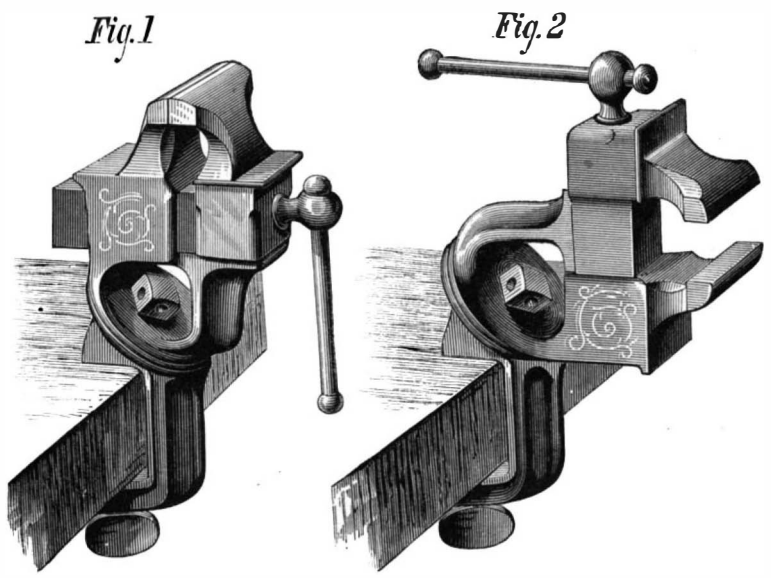
IMPROVED VERTICAL AND HORIZONTAL VISE.

Vises are common that swivel upon a vertical axis, also upon a horizontal axis, but in both cases the jaws always stand in vertical planes. Other vises for holding saws to file turn on a ball and socket joint, allowing a variety of positions to the jaws, varying from vertical, but not approaching horizontal.

The vise here illustrated is so hung upon an angular swivel that a half revolution upon its base brings the jaws from a vertical position (shown in Fig. 1) to a horizontal position (Fig. 2). In their passage from one position to the other, the jaws occupy every angle of inclination, and the vise may be fastened to its base in any position. Our illustration represents a jeweler's portable or clamp vise, arranged to fasten to any table without marring it. The two plates of the swivel are faced true, and held together very firmly by a central bolt, which may be made fast by a tenpenny nail as a lever to turn the bolt. The larger vises turn upon a large cylindrical bearing which projects into the lower plate, the plates and bearing being turned true, and the binding bolt, or nut, is turned by any wrench beneath the bench. It may be changed from one position to the other in a few seconds. Work in the shape of broad thin pieces, and many other forms, must be held by the sides upon which it is desired to work, and, held in the old-style vertical vise, the position is often very awkward. With this vise pieces may be held with any part face up, or in any desired position. It is claimed to cost no more than any first class swivel vise. For further information address the inventor and manufacturer, W. X. Stevens, East Brookfield, Mass.



STEVENS' VERTICAL AND HORIZONTAL VISE.

Hearing through the Teeth.

It is not every man who can hear with his teeth better than with his ears, but there are two or three employés of the water works who can tell whether water is passing through a pipe by resting the teeth on a stopcock and stopping both ears with the fingers. The operation was performed recently in front of the Massasoit House, where a pipe was supposed to be obstructed. In this case the workman held one end of a small metal rod in his teeth, allowed the other end to touch the top of the stopcock, covered both ears, and quickly said, "I hear a small quantity of water passing through the pipe."—*Springfield (Mass.) Union.*

THE ROBERTS ENGINE.

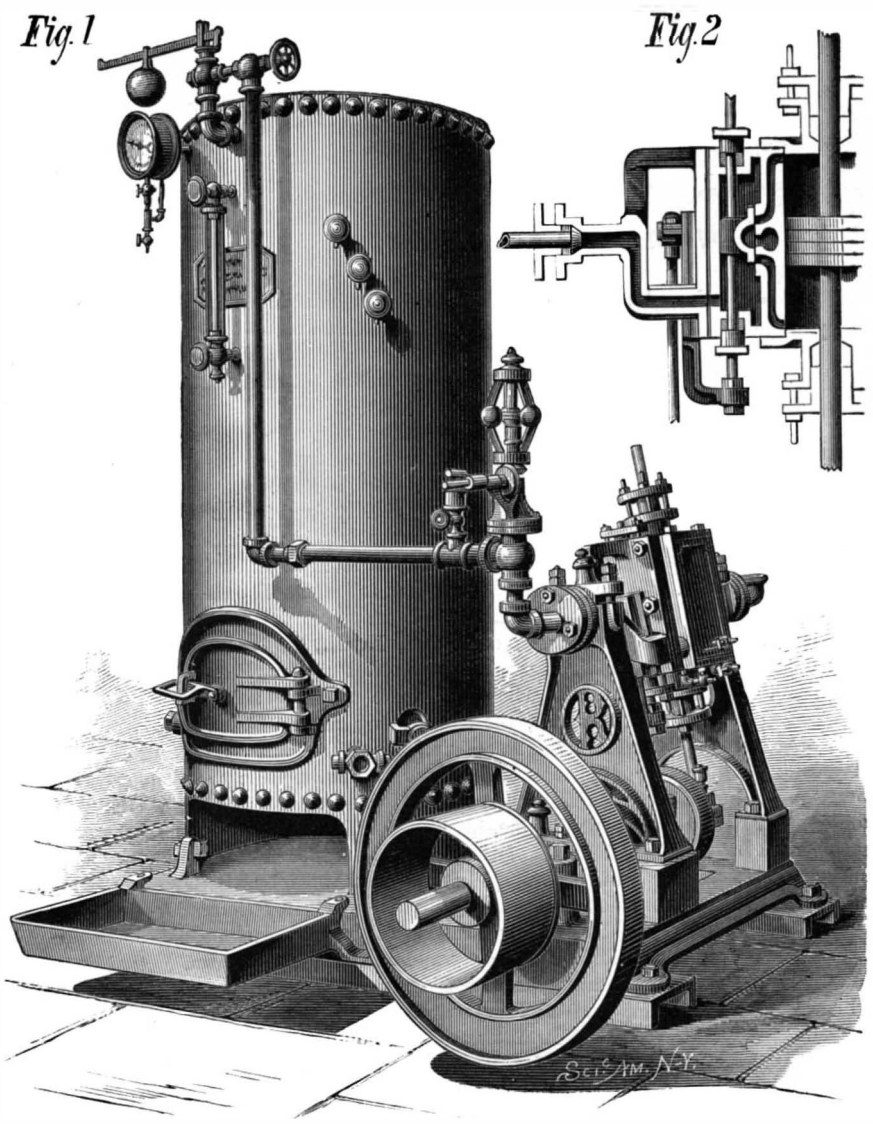
We illustrate herewith a new engine, which is constructed either in portable or detached form, or for marine purposes. The manufacturer claims that it is the cheapest reliable engine in the market; that it is easily cared for, as there are only the crank pin braces to key up; that the piston and valve are so arranged that they cannot wear to a shoulder; that all wearing parts are adjustable and can be taken up; and that the best material is used throughout. It is also claimed to be free from the usual disadvantages of the oscillating engine, through the employment of the following device. The stem of the slide valve passes entirely through the steam chest, and is connected at the lower end with a yoke. This yoke passes (between guides) up on the back of the steam chest cover, and has a steel pin inserted in it at a point exactly in the center of oscillation of the cylinder. The eccentric rod passes vertically between the two lower divisions of the steam trunnion, and connects with this pin. It will be seen that, connected in this way, the oscillation of the cylinder does not affect the motion of the eccentric as transmitted to the valve.

The leakage of the trunnions is obviated by making the bottoms of the trunnion stuffing boxes similar to ordinary circular valve seats. The end of the steam or exhaust pipe has a collar welded on it, which is turned up like a valve to fit the seat at the bottom of the box, and forms a false bottom for the box. A couple of turns of packing on the back of this valve (or false bottom) are then compressed by the gland, and the box is entirely steam or water tight.

It will be seen that, the pipe and valve being stationary, and the seat or bottom of the box moving with the cylinder, there is a continuous motion between the two, thus keeping the valve "ground in" tight, and the longer the engine runs the less liable the trunnions are to leak. The piston rod, valve rod, and all connections are of steel. The cylinder heads are recessed into the cylinder, with bearings, filled with anti-friction metal, under the piston rod stuffing boxes. The cylinder, the jacket, the steam chest, and exhaust trunnion are cast together in one piece. The steam chest cover and steam trunnion are also cast in one piece. The steam trunnion and casting, after passing through the bearing, or box, on the side frame, is divided into three parts, each of which is connected with the steam chest cover at different points. These are hollow, and allow the passage of the steam from the trunnion proper into the steam chest. The passage of the steam from the steam chest into the cylinder is regulated by a three-ported slide valve of the usual shape, having sufficient lap to act as an expansion valve, cutting off the steam at, say, five eighths of the stroke, and thus, by using the elasticity of the steam already admitted, forcing the piston to the end of the stroke without further expenditure of fuel. The exhaust steam then passes all around the cylinder, between it and the square external jacket, to the exhaust trunnion, thus keeping the cylinder hot, and preventing loss by radiation of heat from the steam in the cylinder while doing its work. Our illustration represents the portable form of this engine, wherein it is combined with a vertical tubular boiler, on rolled channel iron skids, in such a manner that either the engine or the boiler can face in either of three different directions, and be thus adapted to the position it is intended to occupy. The boiler is made of the best standard charcoal iron throughout, and tested to 175 lbs. hydrostatic pressure to the square inch, and insured. The outer shell of boiler is extended below the boiler proper so as to form an ash pit, and keep the bottom of the boiler free from ashes and dampness, thus avoiding the rapid deterioration usual in that part. This style of boiler is claimed to secure the greatest possible depth of water over the crown sheet, avoiding the liability to being burned, and does not require any fusible plug, such as has been adopted for safety where there is but a small body of water over the crown sheet. The boiler has an unusually large amount of heating surface in the tubes, it being at the rate of twenty-five square feet of heating surface to one square foot of grate, thus insuring that a very large proportion of the heat will be taken up by the water before the escape of the heated draught into the chimney.

It is stated that a tube can be removed and replaced in thirty minutes, and that steam can be raised in twenty minutes. The whole furnace is entirely surrounded by water, which is heated on the crown sheet and among the tubes (which are in the center of the boiler), rises, gives off its steam, and descends next to the comparatively cool outer shell. The circulation carries all foreign substances which make scale to the bottom, from which they can be removed periodically through the hand holes, or, when under steam, by means of the blow cock. For feeding purposes an injector is used. A cast iron base plate of handsome pattern is furnished with each boiler, the latter being bolted to lugs on the same, and both the base plate of the boiler and that of the engine firmly bolted to skids made of rolled channel iron, instead of the usual timbers, thus insuring lightness combined with great strength. The whole design is attractive, handsomely finished, painted striped, decorated, and varnished, and leaves little to be desired in appearance.

This engine is designed for use wherever a small power is desired, and is at present made in two sizes, six and ten horse power. It is well adapted for printing, grinding apples, sawing wood, ginning cotton, or running small shops, and is well suited for use as a hoister or an elevator engine; and it works well in pairs at an angle of 90°. We are informed that it has hoisted 100 bales of cotton out of a vessel in twenty-eight minutes, this being very rapid work when the bales are hoisted and manipulated singly. For further information as to price, etc., address Mr. E. E. Roberts, 107 Liberty street, New York city.



THE ROBERTS ENGINE.

Respiration at High Altitudes.

At a late meeting of the Royal Society Dr. William Marcet communicated a paper on "An Experimental Inquiry into the Function of Respiration at Various Altitudes." His experiments were mainly undertaken with the view of inquiry into the state of the respiration of tourists at various altitudes, and under the different circumstances met with on Alpine excursions. Pettenkofer's method was adopted in the estimation of carbonic acid, and the experiments were many in number. The ori-nasal mask worn to collect the air breathed out, and the india rubber bags that received the breath, were described. Dr. Marcet confirmed previous experiments in the fact that the quantity of carbonic acid breathed out is greater after food has been taken, and in his experiments on respiration at high altitudes he endeavored to neutralize the effect of food by taking an early breakfast and a late dinner and doing the climbing between the meals. Experiments were made at the Breithorn, 13,685 feet; St. Theodule, 10,899 feet; the Riffel, 8,428 feet; St. Bernard, 8,115 feet; and the Lake of Geneva, 1,230 feet. In experiments made while sitting, Dr. Marcet finds that there is an increase of carbonic acid breathed out as a person rises above the sea on a mountain excursion, and that this is due to the fall of the atmospheric temperature, and to the cold produced by increased evaporation from the body, arising from the diminished pressure of the atmosphere. In short, more carbonic acid is formed in the body to counterbalance the influence of cold from the causes just mentioned. If on ascending to a higher level we should find the same atmospheric temperature as we left at the lower station, still an increased amount of carbonic acid would be expected on account of the cold due to the greater cutaneous and pulmonary evaporation. Dr. Marcet experimented in a similar manner while ascending hills. Walking up rapidly over rocks and grass patches yields most carbonic acid, the amount being 3·155 grms. per minute, which, he said, was attended with the inhalation of the largest volume of air breathed. Ascending quickly at the height of St. Theodule caused a considerable elimination of carbonic acid through the lungs, amounting to 2·972 grms. On the other hand, walking leisurely uphill at the St. Bernard gave rise to the production of no more carbonic acid than quick walking on the level ground at that same station.

Water in the Ears.

A timely warning, to those about to enjoy the summer luxury of sea bathing, is given in the *Medical Record*, by Dr. Sexton, of the New York Ear Infirmary. He finds salt water to be peculiarly irritating to the delicate membrane

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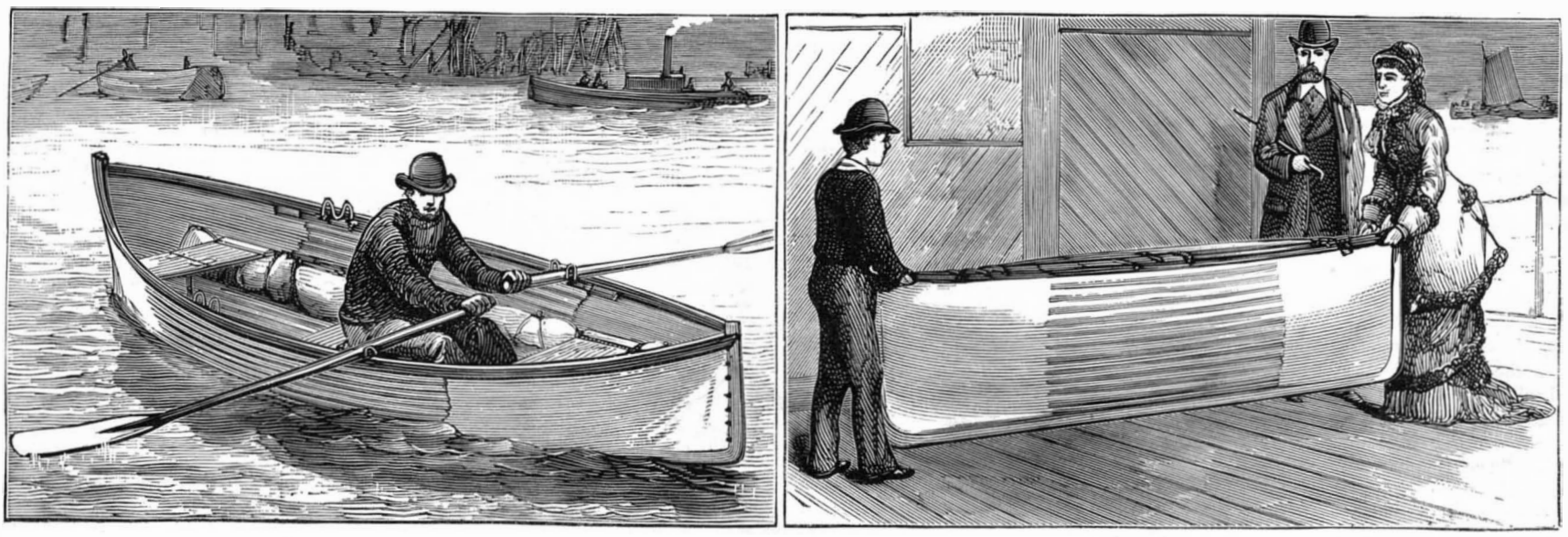
of the inner ear, while cold fresh water may be equally injurious. Every year hundreds of people are sent to the infirmary for treatment whose trouble has arisen from getting water into their ears while bathing, or from catching cold in the ears at such times. He recommends, as a precaution, the plugging of the ears with cotton before entering the water, particularly in surf bathing.

NEW COLLAPSING BOAT.

This boat, which is the invention of Mr. W. H. Crispin, of Stratford, England, is made entirely of very thin steel, a material which is at once light, tough, and durable. The engraving, which we copy from the London *Graphic*, shows a specimen boat, 11 feet in length by 3 feet 9 inches beam. The ends are of smooth metal, and the body of corrugated steel, and the craft is rendered unsinkable by placing air bags beneath the thwarts. When closed for stowage the diameter is only 16 inches, and it is made to expand while being lowered from the davits. The contrivance is intended for passenger vessels, and troop and emigrant ships, where space must be economized, and yet sufficient boat accommodation, in case of accident, is absolutely necessary. The inventor intends, it is said, substituting phosphor-bronze for steel, combining equal tenacity with less weight.



CRISPIN'S COLLAPSING BOAT.

THE ANT BEAR.

The great ant eater, ant bear, or tamanoir, as the subject of our illustration is indiscriminately termed, is a curious animal, both in its appearance and in its habits. It is known among zoölogists as *Myrmecophaga jubata*, and is a native of Guiana, Brazil, and Paraguay. It is entirely destitute of teeth, but nature has offset this deficiency by a most liberal supply of tongue—a member which it uses most skillfully in the capture of its peculiar food, the termites and other ants. In total length it measures between six and seven feet, the tail being about two feet six inches long. The head is remarkably elongated and narrow, and is well adapted to the animal's mode of life. The body is covered with long, coarse hair, which on the tail forms a heavy plume, with which, while sleeping, the ant bear covers himself, looking, it is said, very much like a rough bundle of hay carelessly thrown upon the ground rather than like a living being. The prevailing color is brown, washed with gray on the head and face, and interspersed with white hairs. The throat is black, and a long triangular black mark arises from the throat and passes obliquely over the shoulders. There are four toes on the fore feet, and five on the hind feet, provided with long, curved claws, which are very inconvenient in locomotion, but form efficient weapons. As will be seen from the representation of the animal in the foreground of our engraving, when walking the claws of the fore feet are folded back, the weight resting on the knuckles.

THE ANT BEAR.

A New Phase of Warfare.

The use of magazine rifles in the Russo-Turkish war has practically demonstrated the impossibility of capturing by assault and direct fire any position affording shelter for riflemen. The same experience has shown also that it is quite possible with modern arms to make untenable many positions hitherto considered perfectly sheltered and secure. Many Russian soldiers have been struck beyond the usual rifle range, and even when lying behind considerable elevations separating them from the enemy. At Schipka Pass General Dragomiroff was wounded in the knee by a bullet from a Turkish rifle on the opposite side of a mountain. A number of the Russian rank and file were hit in like manner at the same place, the balls rising high in air, passing the summit of the mountain, and doing execution as they fell. In view of these casualties a correspondent of the London *Times* suggests that it would not be difficult to devise a system of vertical or dropping fire to reach an enemy hidden behind a wood or a ridge. It is easy to conceive how demoralizing to a body of troops waiting in reserve—without the excitement of action—would be a shower of bullets from unseen enemies, dropping over the very ridge they had relied on for protection. The Gatling gun is mentioned as capable of utilization in this way. The distance being determined by an ordinary range finder, all that is required is a simple instrument to indicate the correct elevation to be given to the rifle barrel. Here is a chance for some inventor to make a new and very useful addition to military arms.

A Natural Theater.

The Temple is a side cañon some four and a half miles from Cañon City, and was discovered but a year or two ago. Once through the great rifts of rock, for all the world like the stairway of some grand place of amusement, the body of the Temple is reached, and, to the tourist's astonishment, before him is a stage, with overhanging arch, with "flats" and "flies," with dressing rooms on either side, and a scene already set as if for some grand tableau. If so intensely realistic from the parquet, as the broad circling floor might aptly be termed, or from the parquet or dress circles, as the higher ledges would suggest, the clamber up to the stage itself renders it all the more so. The stage is at the least thirty feet deep, and some sixty or seventy broad, the arch above is fully one hundred feet from the floor of the cañon, the stage itself being about forty feet above the floor. The arch is almost as smooth and perfectly proportioned as if fashioned by the hand of man. Upon the rear wall of the stage quite an aperture has been hewn out by some action, and the shape it is left in is peculiarly suggestive of tableau preparations. There is absolutely not a solitary sign of vegetation about the Temple; all is bleak, bare, and towering, and a more weird spot to visit cannot possibly be imagined.—*Rocky Mountain Tourist.*

The Earthquakes of Fifteen Centuries.

Minister Bingham has sent from Japan a very interesting paper by a native savant on the earthquakes that have occurred in that country during the past fifteen hundred years. The number of destructive earthquakes recorded is 149. The ninth century was most prolific in these, reaching 28; in the fifteenth century there were 15; the same in the seventeenth; 13 in the 18th; and 16 in the present century. The recorded average is one great earthquake every ten years, but the nineteenth century gives one every five years. Unusually high temperature and strange atmospheric changes have been noticed as precursors of great convulsions, especially in the earthquake which desolated the city of Yeddo in 1855.

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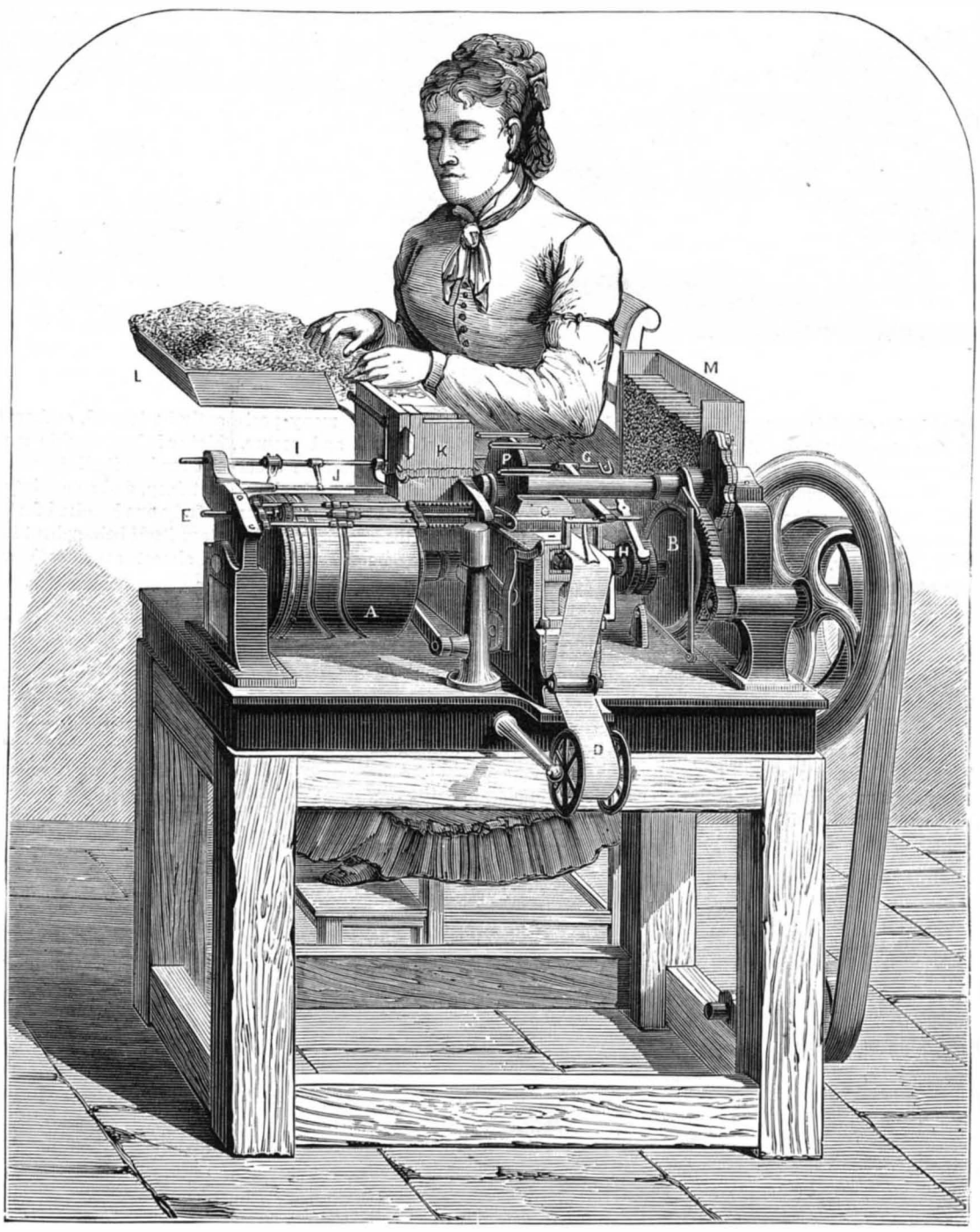
CIGARETTE MAKING BY MACHINERY.

We called attention, recently, to the remarkable increase which has taken place in the production of cigarettes, as evidenced by the many hundred brands of them now in the market, as compared with the very few of ten years ago. It seemed probable that this might be accounted for, in this country, by the general monetary stringency which has induced many to retrench by giving up the cigar in favor of the less costly cigarette; but it appears that the same increase has taken place abroad, where good cigars have always been more expensive than here, and where, at the same time, cigarette smoking has been far more prevalent. In France, where the cigarettes are made in government factories, the aggregate total yearly produced has grown from 10,000,000 ten years ago to 649,000,000 in 1877; so that, as a consequence, hand work and simple machinery have proved inadequate to making the supply, and the attention of inventors has been called to the necessity of mechanism for manufacturing cigarettes rapidly, cheaply, and in large numbers.

Hand made cigarettes often rolled, as they are required, by smokers themselves, consist simply of a little loose tobacco enveloped in a rectangle of paper. This last is usually made of rice, or, for Havana cigarettes, of nearly pure cellulose, and the tobacco is either in the form of broken leaf or in fine shreds. To imitate the peculiar deftness of the fingers of the skilled roller of the cigarette, by means of machinery, requires considerable ingenuity, and, as in most apparatus of the kind, where very little motive power is expended, the necessary movements are best imitated by means of cams. These mechanical devices underlie the operation of the new machine which has lately been introduced in France, an engraving of which, taken from *La Nature*, is herewith presented, in which A is a cylindrical, and B a plane cam. The work consists in making the paper tube, and then filling it with tobacco. To accomplish the first by means of the carriage, C, a strip of paper is unrolled from the coil, D. This paper is previously prepared, in a band of about 3 inches in breadth, equaling the length of the cigarette. When a sufficient quantity (about 1 inch) is unwound it is cut off and presented to a mandrel, E, temporarily introduced into one of the tubes of the mould carrier, P. This mandrel has a clamp which grasps the paper, rolls it, and at the moment the latter escapes from the carriage its free end is brought down upon a rubber pad covered with mucilage. This part of the apparatus is concealed in our illustration by the carriage, C. The paper tube is now left in the mould, the mandrel being extracted by the cam, A. The mould carrier is then turned one ninth of a revolution by the cam, B, a new tube comes in line, and the operation already described is repeated.



CIGARETTE MAKING BY MACHINERY.

The next process is to fill the tube with tobacco. After six paper tubes are completed, the first one made is pushed by a small piston, G, which is actuated by a cam, H, upon the end of the filling or funnel tube. Immediately after the rod, I, actuated by cam, A, drives into this tube a portion of the tobacco prepared in the "compressor," K. In preparing this tobacco, the work of the operative is necessary to dispose the material in regular layers on a carrier, by which it is transported into the compressor. When the cigarette envelope is filled, the mould carrier again makes part of a revolution, and the finished cigarette is pushed out of the mould by the rod, J, also actuated by cam, A. There is a device which lastly introduces the finished cigarettes into the box, M, at the bottom.

A good workman can make about 1,200 cigarettes in ten hours by hand labor only; with the aid of this machine it is stated that 9,600 can be produced in the same period.

A STEEL STEAMER 216 feet long and 30 feet beam, the first large vessel of the kind, was recently launched on the Tyne, England.

The Sponge Trade of the Bahamas.

The uses of the sponge have become so universal and multifarious throughout the world that the demand is constantly increasing, and already the sponge fisheries form an important industry in at least two sections of the world. The sponges of commerce are obtained chiefly from the Bahama Islands and the Grecian Archipelago or eastern Mediterranean Sea. The numerous uses of the sponge can hardly be reckoned in a brief article; but it is almost impossible that in cheapness and utility any substitute for this article can ever be found. It enters largely into our domestic economy, and for toilet purposes is almost a necessity. Sponges are an indispensable article for surgeons' use, both in the hospital and on the battle field, or for any use requiring their moisture absorbing and moisture giving qualities. The exterior is both elastic and prickly, so that in cleansing delicate or polished surfaces the finer sponges have no equal, much less a superior. Within the past few years sponges have been much used in packing delicate glassware and statuary, being better for that purpose than either cotton, straw, or shavings, and mattresses or cushions made of sponges are neither new nor uncommon. In fact, there seems to be no limit to the variety of uses to which this product of the sea may be adapted.

We may readily infer from the increase of trade in sponges that the industry is yet in its infancy, and that in years to come it will grow to the rank and dignity of a commerce, employing large capital, fleets of vessels, and thousands of skilled workmen in all branches of the business. Our own interests in this trade are more closely allied to those of the Bahamas. Our proximity and frequent communication with their chief port and capital city, Nassau, N. P., make New York the natural entrepot of this trade, and having recently visited those islands I beg leave to present a few facts which may prove of interest.

In the year 1877, 250,000 pounds, or about $125,000 worth, of sponges were exported from the Bahamas. Of this amount nearly 100,000 pounds were brought to the United States, and the remainder sent to England and Canada; and the resident merchants expect a large increase in the trade this year.

The varieties of sponges known to commerce (given in order of their value) are: the sheepwool, silk or glove, velvet, reef, yellow, honeycomb, hardhead, and grass. The sheepwool is the most valuable, being a tough, elastic sponge, and probably the finest kind known for the bath. The velvet is a softer variety, and is much used for packing; it is also a good sponge for toilet purposes, but is not so tough or durable as the sheepwool. Silk or glove sponges are the most delicate and elastic of all the varieties, and are the sponges used by surgeons. Its ashes were once a favorite remedy for scrofulous diseases, but iodine and bromine, from which the ashes derived their value, are now given in other forms. The reef sponge resembles the glove, but is coarser. It is used for packing, making mattresses and cushions, and for the toilet. Yellow, hardhead, honeycomb, and grass sponges are useful for various household purposes, washing carriages, rubbing down horses, and also for packing and padding.

The sponge fisheries give employment to about 500 vessels and 2,000 persons, mostly colored. The vessels cruise among the different islands, the best sponges coming from off Abaco. Their trips extend from two to six weeks, according to the size of the vessel and the state of the weather, as the divers are unable to work in rough water. When first taken from the sea the sponge is a black, gelatinous mass, emitting a very disagreeable odor, which increases as the mass putrefies.

After the divers have gathered a sufficient quantity, these black masses, forming the sponges, are taken ashore, where they are either buried in the sand or exposed to the sun for several days; after decomposition has ceased the sponges are beaten with clubs, this beating removing many of the dead animals in the form of black dust. This is followed by a thorough washing in sea water, after which they are stowed in the vessel's hold. The former method of cleansing the sponges was to put them in a wire cage (after the sand burial) and expose them to the action of the tide, which would remove all extraneous matter; but as the salt water would also rot the sponge, the old method is not now practiced.

On reaching port the sponges are put in care of the vessel's agent, who divides them into different portions or lots. The sponge merchants or brokers then write their bid or tender for each lot and hand it to the agent, who awards each lot to its highest bidder; the profits of the sale, after paying the vessel's expenses, to be divided among the crew and divers. The purchasers then send their sponge carts to convey their newly bought property to their respective yards. The cart used for this purpose is a two wheeled vehicle, surmounted by high framework to hold the sponges, and is usually drawn by a donkey or diminutive horse. In the yard the sponges are sorted and thoroughly dried; the coarser varieties being washed with lime water to whiten them. They next pass into the hands of the clipper, who with a pair of shears clips off the roots and hard or coarse parts of the sponge. This process requires skillful workmen, as inexperienced hands are apt to cut either too much or not enough off the sponge. After clipping the sponges are ready for the press, where they are baled for shipment. A sponge press is something like a cider press on a large scale, but is made of iron and requires from two to eight men to turn the screw.

As the sponges are sold by the pound and the merchants buy them in quantities, considerable skill is required to make a correct estimate of the number of pounds of clipped sponges in each lot, but the older merchants rarely make a mistake against their own interests. The prices paid in Nassau range from twenty-five cents to $1.50 per pound, according to quality and the state of the market, but the average is about sixty cents. Few of the merchants have grown rich in the trade, but the prospective increase in the demand renders them hopeful for the future. W. H. W.

A FEMALE sperm whale forty feet long was sighted off Sandy Hook May 9, and was driven by fishermen toward the shore until it grounded on a shoal opposite Applegate's Landing. It was then killed with a scythe and towed to Port Monmouth, where it was cut up for oil. Its yield is estimated at sixteen hundred gallons.

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RECENT ERUPTION OF MOUNT HECLA.

Our engraving is from a sketch taken by Capt. Ambrosen, of the Danish mail steamship Valdemar, for the London *Graphic*, and exhibits a singular phase of the recent eruption. On the morning of March 24, about five o'clock, while steaming along the coast from Reykjavik, on the way to the Faroë Isles, those on board the Valdemar witnessed a great volcanic eruption. It appeared to be in a valley about five miles from Hecla, at a point about 1,500 feet above the level of the sea, or 3,500 feet below the summit of Hecla. The flames mounted to an immense distance into the air, apparently about twice the height of the mountain itself. The wind was blowing freshly from the north, and driving the flames and ashes in a southerly direction. The illustration shows the appearance it presented from the sea. About fourteen days previously sharp shocks of earthquake had been felt all over the island, and eruptions had continued more or less since that time. According to the London *Echo*, there are twenty-five more or less active volcanoes, some being mere *solfataras*, in Iceland, the most turbulent of which is Hecla. After the great eruption of 1845, the most terrible on record in Iceland, the augitic ashes cast up so covered the grass and other fodder that nearly all the cattle on the island died.

AMERICAN STEAM FIRE ENGINES.

There are few departments of American manufacture in which more praise is really deserved and less actually given than that of steam fire engines, in which the exacting demands of the purchaser, ever increasing and becoming more varied, have been met by the fiercely competing builders with a skill and promptness hardly less than marvelous.

It must be remembered that in this country of combustible buildings and bad roads the demand must imperatively be for fire engines that shall combine the maxima of lightness, strength, and pumping power, together with great simplicity of construction, quick steaming capacity, and freedom from injury by impure water and from reckless driving to fires.

As regards the boilers, American steam fire engines have but little of which to be ashamed. Without exception they are all vertical, most of them multitubular, having waterleg and submerged smoke dome. Two makers build boilers both multitubular and tubulous—a number of short dependent water tubes extending from the lower flue sheet into the combustion chamber. In one of these types an inner tube causes circulation in each water tube. In the other, this is substituted by three partition slips of sheet iron. In another boiler the fire box has tapering walls. In all the employment of "variable exhaust nozzles" is a marked feature. One make, different from all others in the world, and popular in our Western States, has a coil boiler, in which the water is pumped, in small quantity at a time, and vaporized rapidly. Generally there are automatically coupling heater attachments, by which a low steam pressure is constantly maintained while in the house, while steam from cold water in three minutes is by no means an unusual performance. Steel is as yet but little used for boilers. One or two makers are supplied with fresh water tanks for boiler supply. Few heat the feed water. Some can feed both from a donkey pump driven while the main engine and pump are working, and from the main pump. The "rotaries" have independent rotary donkeys, and also independent reciprocating feeders. The forced generation supplies steam so wet that the use of the ordinary locomotive injector is not feasible and not attempted—a fact greatly to be regretted. It is possible that the duplex injector, or "inspirator," might fill the bill. Nearly all the reciprocating engines work with from 100 to 160 pounds boiler pressure; the rotaries, at 60 to 80 pounds.

In the engines there is perhaps marked room for improvement. The advocates of the rotary and of the rotatory (commonly called reciprocating) systems are here in fierce rivalry; there being two builders of rotaries on the Holly system (two pistons working together as true spur wheels), one of these employing adjustable packing plates on the ends of the revolvers. Of the reciprocating engines but two types are horizontal; one of these employing a rock valve, the other a plain slide valve moved by a complication of bell cranks.

As regards the transmission of motion from the steam piston to that of the pump, in the reciprocating types, the usage is about equally divided between the "yoke and block" and the crank, the former giving the greatest compactness and stiffness, but the most friction.

With pumps the usage is, while generally excellent, most remarkably various, there being about as many styles as makers. The general division into rotary and reciprocating here obtains; those of the latter class being either vertical or horizontal, and in the most marked variety as regards disposition, material, number, and proportions of valves (all, however, being double acting). At present there are but two builders using horizontal pumps, the vertical being given the preference from their greater compactness and stiffness, freedom from rocking the machine, more even wear of cylinder and piston, greater regularity of suction distribution, etc. The horizontal types have, in all sizes, but one steam and one pump cylinder; the vertical are built both single and duplex (generally the latter), and in some cases having a device for running either half independently in case of damage to the other. Both cast iron and brass are used for the pump barrels, the latter metal being required when salt or foul water is to be used. In all makes (except one of the two horizontal types alluded to) the valves are brass or rubbar faced poppets, many in number, interchangeable, and having short lift and springs to cause quick seating. In scarcely any two makes are the valves grouped alike or placed similarly as regards the axis of the pump barrel. In most instances the provision for removing a valve in very short time is praiseworthy.

With one exception the pistons are solid plungers. In one of the horizontals the plunger consists of a smoothly turned solid center attached to the piston rod, and having around it a sleeve bored true inside and turned outside to fit the barrel proper. This sleeve may be made to act as a part of the piston or a bushing to the barrel at will, thus varying the piston area and giving, as desired, either volume or pressure of discharge. With two makers in one Eastern city the usage prevails of putting one of the pumps and engines parallel before the other, giving a stiff trussed frame, permitting the engineer to have one side of the machine as the "working side," and thus not requiring him to go from one side to the other.

The air chambers are large and well proportioned, save perhaps in the neck, where they are too narrow. One Western builder has an air pump to counteract absorption and keep the chamber properly cushioned. There is always a vacuum chamber to aid steady suction supply. In one case this is contained within the discharge air chamber. There are generally two suction and three discharge connections, so as to make the engines "right or left handed." The discharge gates have tight and quick acting valves. The rotary and the horizontal makes have the suction hose permanently attached, and carried "squirrel tail" fashion; and draught from the center of the front of the machine. This saves the time required to attach the heavy suction hose, and that ordinarily wasted by the others in "backing and filling" before a hydrant to get the right distance.

Nearly all the reciprocating machines have "relief valves," opening communication between both ends of the pump (or else between the discharge side and the suction) to permit of pumping up to feed the boiler without supplying the hose. With but few exceptions the wheels are of American hickory, with patent hubs. One builder puts in strong steel fellies, with spokes set staggering from a very long gun metal hub, making a light and strong wheel. At present nearly all the frames are made "crane necked," which gives ease and quickness of turning and of ranging into position.

We may say that in general the American steam fire engine is distinguished for remarkable rapidity and capacity of steam generation, lightness and strength of frame and running gear, the greatest force of volume of discharge known in its field, and elaboration of ornamental detail.

The principal faults to be mentioned are the very general low efficiency of the steam cylinders; the great quantity of coal ejected bodily from the stack by the exhaust of the reciprocating styles; necessity of running the engine in order to feed the boiler in most makes; inadequate area of suction inlet and valves in many of the vertical reciprocating pumps; the danger to the driver, perched high up on the engine instead of riding the horses.

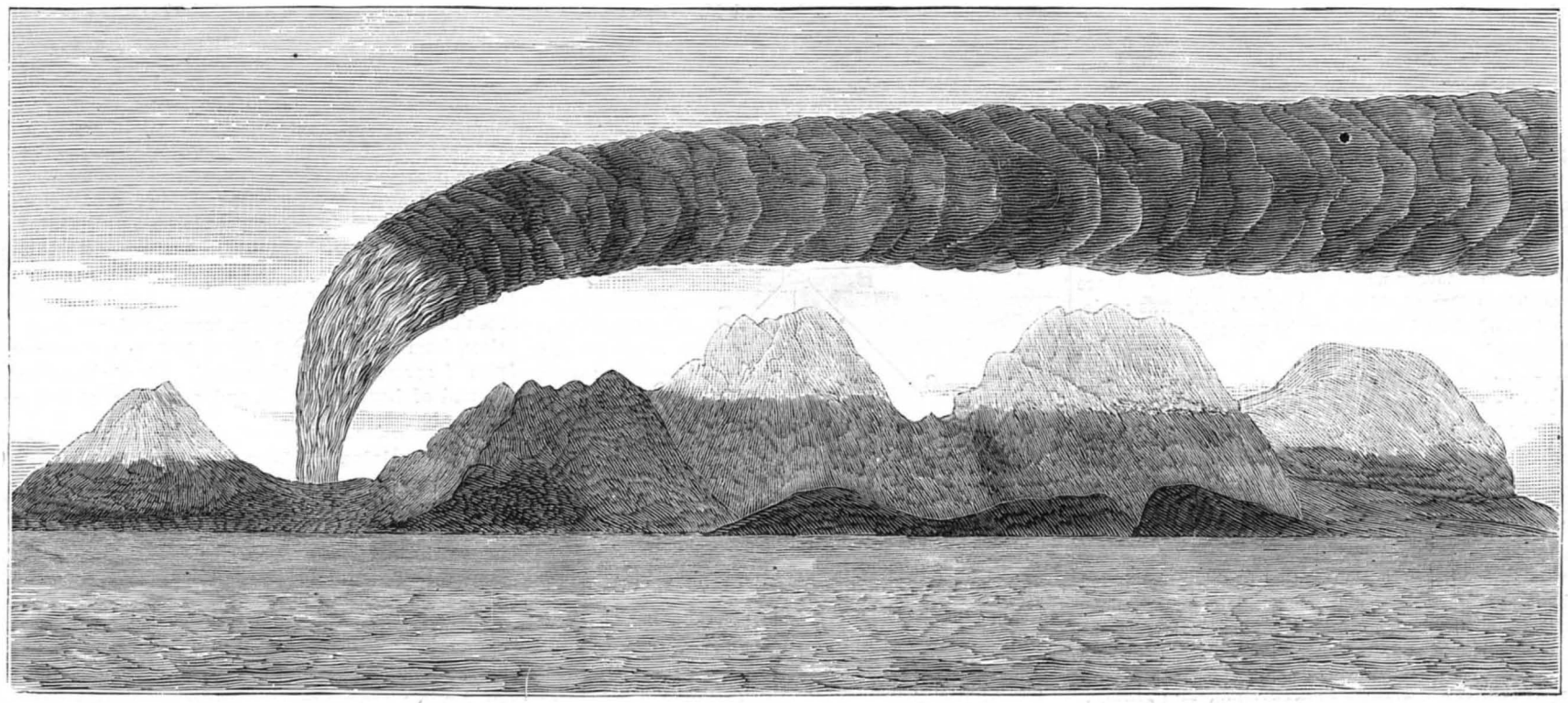
We would suggest the use of steel boilers, double riveted "staggering," with steel rivets of oval section, in drilled or in punched and annealed holes; the use of the injector, at least as an auxiliary to the pump; and a feed heater when the latter is used; the coning of the fire box walls; more general introduction of the Perkins or Field suspended water tubes; blowing with live instead of with exhaust steam; shorter cut off and more cushion; larger suction inlets and valve area than are now general. G.

How British Commerce helps British Manufactures.

In an able review of the condition and prospects of the British Empire in the *Nineteenth Century*, Sir Julius Vogel incidentally points out one secret of England's command of the carrying trade of the world, and the importance of that trade to the prosperity of her mechanical industries. The groove into which the conduct of England's shipping has fallen supplies one of the largest systems of trade protection and bounty that has ever been in operation. The whole principle on which the English shipping trade with other countries is conducted is to make the homeward freight supply the profits. On the outward route a bare return to cover expenses, and sometimes not even that, is submitted to, the homeward voyage to make the whole trip a profitable one. For instance, a ship carrying out a $100,000 cargo, makes for her outward freight $12,500. She will under ordinary circumstances make at least $25,000 on the way home, or $37,500 on the entire trip.

If this were equally divided there would be a return of $18,750 each way; the difference between that amount and the sum actually received on the outward route is $6,250, and that is so much bounty to the cargo carried out, or 6¼ per cent. And the same amount may be added as an impost on the homeward freight. This system has arisen accidentally; nevertheless it greatly helps England's exterior trade, the prosperity of which has been largely due to her control of the merchant marine. It will be readily seen how critical would be England's position in case a foreign war should seriously interfere with her commercial supremacy. England is now one vast industrial concern. Deprive her of the means of making that industry profitable, and the loss of wealth would be as rapid as the previous gain.

THE Kansas City *Price Current* says that the drive of Texas cattle this season will reach fully three hundred thousand head in good condition, and they will reach their destination much earlier than last year. Eighty-five thousand head of cattle in Southern Kansas will be ready to go to market by the middle of June.



ERUPTION OF MOUNT HECLA, ICELAND.

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SOME RECENT FACTS ABOUT COMMON POISONS.

STRYCHNINE.

According to the *Lancet*, Dr. Attilio Lelli, having met with a case in which a large dose of strychnine had been administered in coffee without fatal consequences, was led to institute a series of experiments to determine whether coffee possessed any antitoxic power against the drug. The animals employed were rabbits; and he found, by comparative trials, that a dose of 5 centigrammes (0·77 grain) proved fatal in a short space of time; when the same, in a larger dose, was given in a very strong infusion of coffee, he found that the latter acted either as a complete antidote in preventing the poisonous effects of the strychnine, or that it materially diminished the violence of its action. This is interesting, but it must be noted that the strychnine was given in coffee, no doubt good and strong. It is probable that coffee taken after poisoning with the deadly drug would have but little appreciable effect.

By means of experiments made under the direction of the British Medical Association, last year, it was conclusively proved that a fatal dose of strychnine could be neutralized by a fatal dose of chloral hydrate. A correspondent of *Nature* writes to that journal another instance confirmatory of the foregoing fact. A favorite Skye terrier having been poisoned accidentally by eating some bread spread over with "vermin killer," containing strychnine to the amount of about one sixth of a grain, he at once injected under the dog's skin forty-five grains of the chloral in solution. This quantity of chloral he estimated to be a fatal dose for the dog, inasmuch as the minimum fatal dose for a rabbit (weighing half as much as the latter) had been proved to be twenty-one grains. In a quarter of an hour, fancying the dog was dead (as the spasms had ceased and it lay apparently lifeless) he moved it with his foot, when it at once struggled to its feet and staggered off. It was then fed with some milk, and, with the exception of being quieter than usual, seemed none the worse for the ordeal it had passed through.

Dr. W. E. M. Quiston, of Atoka, Tenn., records a case of recovery from poisoning by strychnine. A young woman on September 13, 1877, took a dose of the poison to commit suicide. Ten minutes afterwards she regretted the act and asked her parents to send for a doctor. When he came he administered chloroform, which produced an immediate improvement. A strong emetic was given, and the stomach was then kept full of sweet oil, white of egg, and linseed tea, while mild inhalations of chloroform were administered as occasion seemed to demand. The result was a complete recovery within a comparatively short space of time. The action of chloroform in this case was analogous to that of chloral hydrate in the preceding notes.

ARSENIC.

R. V. Mattison, in a paper read at the Alumni meeting of the Philadelphia College of Pharmacy, claims to have fully established the question of the efficacy of dialyzed iron as an antidote for arsenical poisoning. He states that common salt should always be given to the subject immediately after the iron solution, for the purpose of precipitating the iron, in case the gastric juice should fail to be sufficient.

It has been discovered by Rouyer that freshly precipitated sesquihydrate of iron, although an antidote for arsenious acid (arsenic of the shops), fails entirely to counteract the action of arseniate of soda or arsenite of potassa (Fowler's solution), but that a mixture of a solution of the sesquichloride of iron and the oxide of magnesium will counteract the effect of these salts, as well as the arsenious acid itself, and hence this mixture is always to be preferred to the hydrate in cases of poisoning by arsenic. The officinal solution of the sesquichloride of iron should first be administered, and afterwards the magnesia. In one hour after the administration of the antidote, a cathartic should be given. In all cases acid drinks (such as lemonade) are to be avoided, since the compounds they form are soluble.

The poison most commonly used for criminal purposes is arsenic, its tastelessness preventing the victim recognizing it. In view of this, Dr. Jeannel, of Paris, proposes that druggists shall sell arsenic to the public only when so combined that it immediately attracts attention when added, either by accident or design, to food. For this purpose he directs attention to Grimaud's mixture, which consists of about one sixth of a grain each of sulphate of iron and cyanide of potassium to every 15 grains of arsenious acid, forming a light blue powder. On being moistened, however slightly, it becomes of a rich blue color, while the taste is so distinctly chalybeate that it is impossible to overlook its presence in any article of food.

LEAD.

A singular fact is given in the *Journal de Médecine* of the effect of the habitual use of milk in white lead works. In some French lead mills it was observed that, in a large working population, two men who drank much milk daily were not affected by lead. On the general use of milk throughout the works the occurrence of lead colic ceased. Each operator was given enough extra pay to buy a quart of milk a day. From 1868 to 1871 no cases of colic had appeared.

OPIUM.

At a recent meeting of the Medical Society of London, Dr. Milner Fothergill read an interesting case of opium poisoning which he had successfully treated with atropine. The patient, a woman forty-seven years of age, had taken a quantity of laudanum equivalent to 12 grains of opium. Dr. Fothergill, finding her respiration failing, and her condition critical, boldly injected beneath the skin one grain of sulphate of atropia. Strong coffee and sal volatile were afterwards given, and forty-eight hours after the opium had been taken, and forty-five after the injection of the atropine, both poisons were eliminated.

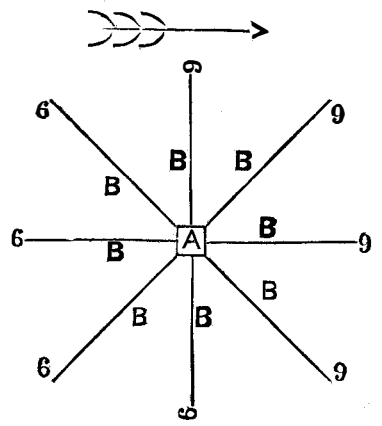
A case somewhat similar is reported by Dr. Lamadrid, of Philadelphia, in which more than ¾ of a grain of atropine was injected in divided doses. As in opium poisoning death occurs chiefly through failure of the respiration, and as atropine is the only known drug which exercises a decidedly stimulating effect on the respiratory centers, the rationale of the treatment is evident.

MUSCARIN.

Through the investigations of Dr. Lauder Brunton, in England, Professor Schiff, in Italy, and others, it has been known for some time that we have a certain antidote for the poison of toadstools (muscarin) in belladonna and stramonium, used either in the form of a tincture made from the leaves of the plants, or in that of their alkaloids, atropia and daturia. The result of some elaborate experiments of Dr. Ringer, recorded in a late number of the *Lancet*, adds another antidote to the toxic principle of toadstools in the shape of a plant known to botanists as *Duboisia myoporoides*. This plant, like belladonna and stramonium, belongs to the order *Solanaceæ*, all the species of which are characterized by narcotic and poisonous properties. *Duboisia* was found to be very similar to, if not identical with, atropia; and, like it, antagonistic to the action of muscarin.

PERPETUAL MOTION.

Of the different types of self-moving machines which have engaged the attention of the believers in the possibility of perpetual motion, one form has steadily remained the favorite. It is that in which the radii or spokes of a wheel carry weights which, by hinges and stops, or in some way, are to be constantly unbalanced. Since the days of Bishop Wilkins, the Marquis of Worcester, and M. Orffyreus, this system, with varying details, has been reinvented many thousands of times, the inventor in each case falling only just a little short of success, usually owing to some slight defect in the model. It has remained for a correspondent of the New York *World* to demonstrate mathematically the soundness of the principle, as applied in a machine invented by him. He writes that he has never made a working model, but that is not necessary, as the diagram has only to be seen to be accepted.



The arms, B B B B B B B B, radiating from the hub, A, carry weights of this peculiar shape, 9, so that the three on the right represent twenty-seven pounds, while the three on the left only amount to eighteen pounds, thus there must always be nine pounds more on the right side than on the left; the sixes on the left become nines when they pass the center, consequently the machine must move; it amounts to a mathematical demonstration, and "figures won't lie."

Hydraulic Salt Mining in Bavaria.

A correspondent of the *World* describes at great length the process of salt mining in use at Berchtesgaden, Bavaria. At this place the salt does not occur in deep rocky strata, as at the Polish mine at Wieliczka, but in a thick layer of saliferous earth in the heart of a mountain. The mine is entered by horizontal shafts, and the salt ingeniously removed by the solvent action of water working upward. At the end of each shaft a chamber is mined, and when it is large enough the entrance is dammed up and the chamber filled with fresh water through an opening at the top. The water is to dissolve out the salt from the roof of the chamber, hence it is necessary that the chamber be kept entirely full. At first the water acts also upon the bottom and sides of the chamber, but soon there is left a pasty waterproof covering of clay which prevents further action. At the top, however, the overlying earth falls away as a fine sediment as fast as the salt is dissolved, leaving always a fresh surface for the water to act upon. The falling sediment forms, under pressure, a water-tight floor to the chamber, which rises as the solution of the roof goes on, so that the chamber slowly climbs from the bottom to the top of the salt yielding stratum. The solution has to go on with the utmost quiet, and not too rapidly, or else fragments of the roof will fall to the bottom, where the water is saturated with salt, and be lost. To keep the water constantly pressing against the roof a proper supply of fresh water is continually added from above. Complete saturation of the water is effected in about three weeks, when it is pumped out and carried in pipes to Reichenhall, twenty miles distant, for evaporation. Fresh water is then pumped into the chamber, and the process repeated until the upper limit of the salt deposit is reached. In this way the mountain is being slowly washed, and its saline treasure stolen away, without removing the clay with which it was associated. The saliferous earth removed in tunneling is refined in the usual way.

A Mouth Telegraph.

M. Mangenot has recently communicated to the French Academy of Sciences a description of a new telegraphic apparatus, to be worked by the mouth. The manipulator consists in two plates of ivory, from one of which leads the conducting wire, and from the other the ground wire. These plates are placed between the lips, and the operator talks or so moves his lips as to make a certain number of breaks and establishments of the current for each word or letter. At the other end of the line is a similar arrangement, the receiver translating the message by the sensations of his tongue.

[We translate the foregoing from a report of the proceedings of the Academy, published in several of our French cotemporaries. The principle is venerable with age, and probably there is no one who has ever repaired a telegraph line that has not tested whether a current was or was not passing by touching his tongue to the wire. The same can be done on wet days with the fingers, although the sensations are not so marked. M. Mangenot appears to have invented nothing but the ivory holders for the wire, and consequently the claim which he makes for the $10,000 Volta prize to the French Government savors considerably of profound assurance.—EDS.]

Steel Exhibits.

Messrs. Jessop & Sons, steelmakers, of Sheffield, have for exhibition at the world's show at Paris a comprehensive collection of specimens of steel in all stages of manufacture, commencing with bar steel and finishing with highly polished bayonets and knife blades. There are best cast steel, in bars ranging from 20 inches square to ⅛ of an inch; similar bars in octagons, hexagons, flats, and rounds, every other bar from the 20 inch square downwards being highly polished to show the steel to be absolutely free from flaws. Then there are special kinds of tool steel in all shapes, forgings of all kinds, and circular plates for circular saws. One of these plates is no less than 10 feet 8 inches in diameter by ½ inch, and is believed to be the largest steel plate of the kind ever shown or made. The exhibits also include a cold rolled band 4½ inches broad by 30 gauge and 200 yards long; a hot rolled band 6½ inches broad by 16 gauge and 120 feet long; wire rods from 300 feet long; saw, reaper, and pen sheets of all sizes, from 16 feet by 3 feet 6 inches; and several samples of severely tested plate steel. Finally there are stars formed of bayonet blades, and stars also of cutlery and scissor blades.

Physiological Treatment of Stuttering.

Very great success is reported as attending the treatment of stuttering by purely physiological training, according to the system of M. Chervin, of Paris. Three types of stuttering are distinguished: First, that occurring during inspiration; second, stuttering during expiration; third, stuttering during both these periods, and between breaths. The treatment is divided into three stages. The first involves various respiratory exercises, during which the pupil is first taught to make a long full inspiration and follow it by regular forcible expiration. Then the respiratory movements are made with various rhythms until they become full, regular, and easy, instead of being jerky, labored, and fatiguing. In the second stage of treatment, exercises with vowel sounds are substituted for the previous mute breathings, giving to each vowel the various modifications of tone, pitch, duration, etc., heard in conversation. The third stage comprises exercises on consonants, alone and in combination with vowels; at first slowly, then rapidly, varying the duration and pitch of each syllable, and passing from words of one syllable to those of two and more. Prepared by these exercises the pupil learns to articulate slowly and methodically short sentences, then longer periods and paragraphs, separating sentences and always beginning with a deep inspiration. Twenty days of this treatment usually suffice for a perfect cure.

Planetary Population.

On the interesting question of the plurality of worlds, Professor Newcomb remarks as follows: "Enthusiastic writers not only sometimes people the planets with inhabitants, but calculate the possible population by the number of square miles of surface, and throw in a liberal supply of astronomers, who scan our earth with powerful telescopes. The possibility of this it would be presumption to deny; but that it is extremely improbable, at least in the case of any one planet, may be seen by reflecting on the brevity of civilization on our globe when compared with the existence of the globe itself as a planet. The latter has probably been revolving in its orbit 10,000,000 years; man has probably existed on it less than 10,000 years; civilization, less than 4,000; telescopes, little more than 200. Had an angel visited it at intervals of 10,000 years to seek for thinking beings, he would have been disappointed a thousand times or more. Reasoning from analogy, we are led to believe that the same disappointments might await him who should now travel from planet to planet, and from system to system, on a similar search, until he had examined many thousand planets."

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New Inventions.

In a new Process of Making Ice, the floor of a tank is flooded with water, which is allowed to freeze. A quantity of snow is spread upon the ice thus formed, and the surface of such layer of snow is sprinkled with water to form an icy crust thereon. Water is then admitted to cover the snow and allowed to freeze. Another layer of snow is spread upon this second body of ice; and so the operation goes on until the tank is full of alternating layers of ice and snow. The ice layers may be a foot or more in thickness, but the snow layer will be as thin as practicable. The snow layer enables the ice to be easily cut up into pieces of any required size. Patented by Mr. A. C. Call, of Algona, Iowa.

Mr. M. T. Durkin, of New York city, has invented an improved Skylight, in which the glass-supporting bar is made of sheet metal, and the cap is secured by a peculiar arrangement of clips. No putty is required, and the arrangement is neat and sufficiently strong.

Mr. W. S. Montgomery, of Marshalltown, Iowa, has invented a combined Lock Bolt and Handle, consisting of a combination of a pivoted handle and a connecting link with a sliding bolt, the handle and link being arranged so that by swinging the handle on its pivot the bolt may be moved in or out.

A combined Chair, Cot, and Crib, all in one piece of furniture, is the invention of Mr. H. C. Hayman, of Van Buren, Ark. The device is readily adjusted to perform either of these functions.

Mr. F. Goff, of Chicago, Ill., the inventor of an improvement in the Manufacture of Boots and Shoes, employs a waterproof filling composed of fine particles of cork and rubber mixed together, and applied to a boot or shoe so as to fill the space between the outer and inner sole.

An improved Clothes Line Hanger, patented by Messrs. G. S. Sayers and T. Galligan, of Hyde Park, Pa., is so constructed as to permit the line to be readily detached, and by adjusting the bearing of a pulley, by means of a screw, the slack of the rope may be taken up as required.

Mrs. H. Bowie, of Houma, La., has secured by patent the formula of a Remedy for Pneumonia, Coughs, Colds, etc., which she claims to be unusually efficient.

A new patent Bit for Horses, intended as a cure for shying and bolting, has been invented by Mr. J. H. Robinson, of Manchester Bridge, N. Y. The cross bars of the bit have points which are protected by arched springs until the side pressure forces the points to project through slots in the springs and pierce the horse's mouth. The inventor thinks that a little experience with this bit will enable a horse to be driven safely with an ordinary bit.

Mr. C. A. Kirtland, of New York city, has invented a Plate Glass Face Protector, for screening off the heat from cooking ranges, etc., while permitting the vessels on the range to be seen. The frame containing the glass is pivoted and counterbalanced in such manner as to remain stationary in any position.

An Umbrella Holder, patented by Mr. J. H. Bowers, of Cowan, Tenn., is an arrangement intended to support an umbrella and permit the free use of both hands. It consists of a belt carrying a socket in which the umbrella stick is held, and a chest strap supporting it above, in connection with a single shoulder strap.

Mr. J. Bowman, of Somerset, Ohio, has introduced a number of improvements in the Running Gear of Buggies and other vehicles, which are intended to lessen the expense of manufacture and to allow the stays to be put on and taken off without taking the gear apart.

A new Percussion Shell, invented by Mr. J. M. Urquhart, of Jefferson, Tex., is made in independent sections screwed together and connected by a fuse so as to furnish a number of successive explosions. The tapering point is also charged with powder, and has a number of anvils for caps, inclosed by an outer sheet metal case which explodes the caps on striking an object. Mr. Urquhart has also invented a hand grenade, which may be thrown from a balloon, and which is exploded in the same manner by the yielding of its sheet metal case.

Mr. E. Ridge, of Frankford, Pa., has invented an envelope for Transmitting Samples of flour, sugar, tea and other substances at third class rates through the mails in such a manner that the contents may readily be inspected by the postmaster. It has a supplementary piece gummed to it, inside, and furnishing two end flaps, one of which is sealed in mailing and the other left for resealing after examination by the postmaster.

A new Reverberatory Furnace for metallurgical operations has been invented by Mr. W. Mann, of Newcastle, Pa. It belongs to that form of reverberatory furnace in which the fuel is charged first to one compartment of the furnace, where the gases are partially driven off, and the remaining coke afterward pushed into the main fire chamber. The improvement consists in combining with an ordinary furnace a supplemental furnace and retort, arranged in front of the fire chamber, which retort opens laterally into the fire chamber, and the supplemental furnace opening also into the fire chamber through the retort, and having in the same, beneath the retort, a slow fire with little draught.

Mr. A. A. Danzig, of New York city, has obtained a patent for an improved arrangement of Underwear for Women, greatly simplifying the same.

An ingenious Trundling Toy, invented by Mr. G. W Craig, of Baltimore, Md., consists of a hoop or wheel having a forked pendulum or bar attached to its hub, and carrying an automaton and bell, or signal, which are so applied that they are respectively moved and sounded as the hoop revolves. A forked handle is used to direct and roll the hoop.

Mr. M. Powe, of Phillipsburg, N. J., has made improvements in the construction of the Fifth Wheels of Vehicles, by which, it is claimed, the forward end of the vehicle body will be firmly supported in any position of the fore wheels, the device being light and strong, with wide bearing surfaces, and a secure locking arrangement of the king bolt.

Mr. A. Zerban, of New York city, has originated a convenient Sample Card for exhibiting silks, jewelry, laces, etc., which permits the ready removal, exchange, or adjustment of samples, thus making it possible to rearrange the latter so as to observe the effect of new combinations and contrasts of colors and patterns.

An improved Sandal, for the protection of the feet in wet weather and as a substitute for ice creepers to prevent slipping, has been invented by Miss A. M. Woodhull, of Freehold, N. J. The sole is made of wood, cork, or leather, and has on its under side a piece of rubber which keeps the moisture of the ground from the foot. The sandal is held in position by a toe tip, a strap buckled over the instep, and a wire loop around the heel.

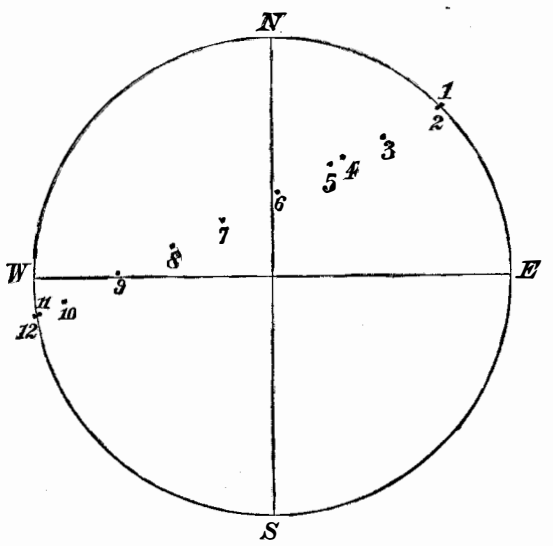
In a new Railway Switch, invented by Mr. R. Gray, of Bloomington, Ill., the improvement consists chiefly in attaching the ends of the switch rails to the ties or sleepers, leaving the body of the rails free or movable and in combining with them a device by which they can be bent or sprung laterally, in order to cause, by centrifugal action, a train of cars to continue on the main line or pass to the side track, as may be desired. Suitable means are provided for operating the switch rails and locking them in either position, which result is effected by an ordinary switch lever, or through the medium of devices attached to the locomotive. The invention further consists in combining the flexible switch rails, fixed at their ends only with tapered and fixed side and main track rails, which are preferably extended past the ends of the switch rails.

OBSERVATIONS ON THE TRANSIT OF MERCURY OF MAY 6, 1878,

MADE BY J. WALTER WOOD AND ALFRED M. MAYER,

On the slope of South Orange Mountain, opposite Montrose, N. J.

These observations were made by projecting the image of the sun on a screen carried by a light frame attached to the eyepiece of the telescope. On the screen were drawn



POSITIONS OF MERCURY DURING THE TRANSIT.

two lines at right angles and parallel to the edges of the board. Around the intersection of these lines was drawn a circle of 3¼ inches in diameter. The image of the sun exactly fitted this diameter. The aperture of the telescope is 3 inches.

Before each observation a level was placed on the upper edge of the screen, and thus one of the lines on the screen was made truly vertical. Of course, at apparent noon this vertical line and the meridian hour circle were coincident. The point of first contact on the circle was determined in reference to the vertical drawn across the circle, and this place was marked. The top edge of the screen was leveled two minutes before the expected time of contact.

The accompanying figure shows the position of Mercury, marked 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12. Number 1 is first contact, 2 is second contact, 11 is third, and 12 is fourth contact. The New York time of the positions of Mercury corresponding to the above numbered loci is as follows, according to our observations:

1	10h.	17m.	12sec.
2	10h.	19m.	35sec.
3	11h.	17m.	00sec.
4	12h.	5m.	04sec.
5	12h.	17m.	00sec.
6	1h.	17m.	00sec.
7	2h.	17m.	00sec.
8	3h.	17m.	00sec.
9	4h.	17m.	00sec.
10	5h.	17m.	00sec.
11	5h.	46m.	03sec.
12	5h.	48m.	12sec.

As the line N S was always vertical it followed that the north point of the sun was in a different position in reference to the line N S at successive observations. These various positions of Mercury in reference to the vertical were, after the transit, reduced in reference to the N and S points on the sun, and in that manner the path and positions of Mercury were obtained in the accompanying figure.

About the middle of the transit we took off the screen, and looked at the limb of the sun through the ocular and a colored glass (London fog). The limb of the sun was brought to a sharp focus. On bringing Mercury into the center of the field he appeared with a hazy border, and we did not succeed by any adjustment in getting a sharp definition. This would seem to indicate an atmosphere surrounding the planet.

The size of Mercury was determined by drawing a series of small circles till one was made which exactly contained the disk of the planet. We thus found that the diameter of Mercury was $\frac{1}{180}$ of that of the sun.

The Mississippi Jetties.

A report is going the rounds of the press that Captain Eads has asked to be released from his engagement to create a channel of thirty feet through the jetties, and has abandoned the undertaking as a failure. This report rose from the fact that the Captain is now in Washington advising that a modification of the plan be made, which will not require the 30 foot channel to be more than 100 feet in width. With such width, the 24 foot channel would probably be not less than 400 feet wide, and the 22 foot channel about 500 feet. The act under which Captain Eads is operating requires a channel nowhere less than 30 feet deep for a width of 350 feet, and it is thought that to create such a width of 30 feet water between the jetties will be injudicious and tend to injure them. Captain Eads expressed this to the committee when the original bill was being drawn, and he is confirmed in his opinion by observation at the jetties, and therefore proposes the modification referred to above. As an increase of the flow into the pass can be readily obtained, not one tenth of the whole discharge being used, it remains entirely for the government to say whether the stipulated size shall be adhered to or not. There is now a depth of 23½ feet in the whole length of the channel, and in one part a hollow of 80 feet in depth has been created by the current through the jetties. By the terms of the law the contractor has until September of next year to create a channel of 24 feet deep, but so fast has the work advanced that it is probable that a channel 250 feet wide, of a depth of 24 feet, will be obtained during this month, as but 3,740 cubic yards of material is in the way of its realization.

Captain Eads also asks for a modification of the mode of paying him for the work done. Upwards of 80 per cent of the work required to complete the jetties has been done, and less than 20 per cent of the contract price has been paid by the government. The delay in payments under the present act is so great that it is impossible to push the work as rapidly as the public interests require. The work is now so far advanced and the success so pronounced that it is for the interests of the government and the country that the work shall be pushed with the utmost vigor to such a point as shall insure the utmost efficiency of action in increasing the capacity of the channel. The board of engineers to whom the question of the modification of the terms of the act was referred approves of it, and it would certainly seem to be good policy to give Captain Eads all the facilities he needs in forwarding the work, due regard being had to the proper progress of the channel, that the money be not advanced faster than the work is performed and the permanent depth of the water assured.

Extending American Commerce.

The agitation of the subject of extending our commerce to South America has had the effect to start two lines of steamers from New York to Brazil, touching at intermediate ports, and a line will soon be put on from New York to Brazil. These lines, it is hoped, will enable us to successfully compete with the Europeans for the large and constantly increasing trade of South America. A line of steamers is also advertised from New York to the Azores, which will soon be extended to the west coast of Africa. In addition to these efforts to extend our commerce, Congress has under consideration the Watson expeditionary survey of a railroad from our colony of Liberia one or two thousand miles into the interior of Africa, with the view of opening up our trade with these populous regions; the road should be built to connect with lines of steamers running to our ports. Great Britain has now two lines of twenty large steamers to Sierra Leone, Liberia, and the west coast, and it is hoped by our railway and steamers to divert a large share of this trade to the United States. It may be objected that the people of Africa are of a much lower grade of civilization than those of South America, and that therefore their trade would be comparatively small; but it should be considered that the Africans number nearly six times as many as the inhabitants of South America, and that were there means of supplying them with our manufactures a large trade would doubtless spring up as they produce many articles which we could profitably take in exchange for our commodities. It is to be hoped also that our colony of Liberia, now increasing with considerable rapidity, will help to extend the trade with that region, and that the colony itself will be helped by the opening up of the country by the railroad and shipping, and its resultant commerce.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advert sements must be received at publication office as early as Thursday morning to appear in next issue.

The Buckeye Engine Co. Automatic Cut-off Engines, condensing or non-condensing, 10 to 1,000 H. P. Power, economy, and governing guaranteed. 87 Liberty St., N.Y.

Vertical Scientific Grain Mills. A.W.Straub & Co.,Phila.

Cornice Brakes. J.M. Robinson & Co., Cincinnati,O.

Sperm Oil, Pure. Wm. F. Nye, New Bedford, Mass.

Power & Foot Presses, Ferracute Co., Bridgeton, N. J.

Water Wheels, increased power. O.J.Bollinger,York,Pa.

Diamond Engineer, J. Dickinson, 64 Nassau St., N.Y.

Vertical & Yacht Engines. N.W.Twiss,NewHaven,Ct.

Painters' Metal Graining Plates. J.J.Callow,Clevel'd,O.

Blake's Belt Studs, the best fastening for Rubber and Leather Belts. Greene, Tweed & Co., 18 Park Place, N.Y.

The SCIENTIFIC AMERICAN Export Edition is pub lished monthly, about the 15th of each month. Every number comprises most of the plates of the four preced- ng weekly numbers of the SCIENTIFIC AMERICAN, with other appropriate contents, business announcements, etc. It forms a large and splendid periodical of nearly one hundred quarto pages, each number illustrated with about one hundred engravings. It is a complete record of American progress in the arts.

Scroll Saws.—Three 2d hand, Cordesman, Egan & Co. make. Send for cuts. Steptoe & Co., 214 W. 2d St., Cin. O.

For Sale.—A 30 ft. Yacht. Yacht and Stationary Engines. Iron and Wood Machinery. S.E.Harthan, Worcester, Mass.

The undersigned wish to obtain financial assistance to carry on a valuable and lucrative industry. Address Cobb & Schreiner, New Iberia, La.

Improved Steel Castings; stiff and durable; as soft and easily worked as wrought iron; tensile strength not less than 65,000 lbs. to sq. in. Circulars free. Pittsburgh Steel Casting Company, Pittsburgh, Pa.

Wanted.—Party to Manufacture on Royalty a Spring Draught Attachment for Vehicles. R. W. Smalley, Salem, Mass.

Rubber Belting, Packing, Hose, and Manufacturers Supplies. Greene, Tweed & Co., 18 Park Place, N. Y.

Wm. Sellers & Co., Phila., have introduced a new Injector, worked by a single motion of a lever.

Valuable Invention to users of Steam Boilers. See advt., page 318, last issue. Address U. S. Automatic Stoker Co., No. 2 Chestnut St., Philadelphia, Pa.

Presses, Dies, and Tools for working Sheet Metals, etc. Fruit and other Can Tools. Bliss & Williams, Brooklyn, N. Y., and Paris Exposition, 1878.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St. Wm. Sellers & Co.

For Heavy Punches, Shears, Boiler Shop Rolls, Radial Drills, etc., send to Hilles & Jones, Wilmington, Del.

Improved Wood-working Machinery made by Walker Bros., 73 and 75 Laurel St., Philadelphia, Pa.

The great Wheelock Engine, which furnishes the power to the machinery of the American Exhibit at the Paris Exposition this year, is lubricated by Patent Lubricene and Cups. Our exhibit will equal that which we made in Philadelphia in 1876. R. J. Chard, 134 M. Lane, N. Y. city.

Friction Clutches for heavy work. Can be run at high speeds,and start gradual. Safety Elevators and Hoisting Machinery a specialty. D. Frisbie & Co., New Haven, Ct.

24 inch Second-hand Planer, and 12 inch Jointer, or Buzz Planer, both in first-class order, for sale by Bentel, Margedant & Co., Hamilton, Ohio.

Wrenches.—The Lipsey "Reliable" is strongest and best. Six inch sample by mail 60 cents. Roper Caloric Engine Manufacturing Co., 91 Washington St., N. Y.

The Cameron Steam Pump mounted in Phosphor Bronze is an indestructible machine. See ad. back page.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

John T. Noye & Son, Buffalo, N. Y., are Manufacturers of Burr Mill Stones and Flour Mill Machinery of all kinds, and dealers in Dufour & Co.'s Bolting Cloth. Send for large illustrated catalogue.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing metals. E. Lyon & Co., 470 Grand St., N. Y.

Manufacturers of Improved Goods who desire to build up a lucrative foreign trade, will do well to insert a well displayed advertisement in the SCIENTIFIC AMERICAN Export Edition. This paper has a very large foreign circulation.

For Boult's Paneling, Moulding, and Dovetailing Machine, and other wood-working machinery, address B.C. Machinery Co., Battle Creek, Mich.

Special Planers for Jointing and Surfacing, Band and Scroll Saws, Universal Wood-workers, etc., manufactured by Bentel, Margedant & Co., Hamilton, Ohio.

Climax Washing Machine. Reliable Agents wanted. Descriptive circulars furnished. N. C. Baughman & Co., York, Pa.

Patent Scroll and Band Saws. Best and cheapest in use. Cordesman, Egan & Co., Cincinnati, O.

Lansdell's Steam Siphon pumps sandy and gritty water as easily as clean. Leng & Ogden, 212 Pearl St., N. Y.

For Best Insulated Telegraph Wire, Telephone Wire, and Flexible Cordage, Eugene F. Phillips, 67 Stewart St., Providence, R. I. W. H. Sawyer, Electrician and Supt.

The Turbine Wheel made by Risdon & Co., Mt. Holly, N. J., gave the best results at Centennial test.

Dead Pulleys, that stop the running of Loose Pulleys and Belts, taking the strain from Line Shaft when Machine is not in use. Taper Sleeve Pulley Works, Erie, Pa.

Notes & Queries

(1) T. S. writes: I am prevented from sleeping by noises in the next room, such as talking, walking, etc. Is there any simple means of deadening the sounds? A. One method is to wear a night cap having very thick soft pads of wool or cotton arranged to cover the ears.

(2) H. M. writes: 1. I have a cylindrical boiler, 7 feet long, 38 inches diameter; fire box 20 by 36 inches; 26 flues, 2 inches, 4½ feet long. What is the power of boiler? A. We do not know of any standard rule for estimating the power of a boiler. 2. My engine has a 5 x 9 inch cylinder. What number of strokes should it make? A. You can run the engine from 250 to 300 revolutions per minute.

(3) F. T. W. asks: How is soluble acid chromate of lime made? A. Boil 33 parts of potassium bichromate in a porcelain-enameled iron vessel with 300 parts of water; cool a little, and add to the solution 1½ times its volume of strong oil of vitriol. When perfectly cool decant the liquid, gather the crystals of chromic acid upon a porous tile, and cover with a jar for an hour. Then dissolve the crystals in 400 parts of water, boil, gradually add 57 parts caustic lime, filter, and evaporate the filtrate to dryness.

(4) A. G. G. has constructed a telescope which shows five or six indistinct images, in addition to a well defined one, and wishes to know wherein the fault lies. A. You neglect to state whether your deflector is silvered on the concave or convex surface. If on the latter, the trouble is easily accounted for; if on the former you will probably find your eyepieces imperfect. Examine the latter thoroughly and see if they do not produce the reflected images.

(5) A. K. writes: I have to draw the water to a vacuum pan a distance of about 40 feet. Now I think that if I lay a pipe 3 inches in diameter 30 feet, and the other 10 feet a pipe of 2 inches diameter, I would get more water in a given time than by having the whole length only 2 inch piping. Am I right or wrong? A. You would get more water in a given time through the combined large and small pipes, as you propose, because the friction of the water in those pipes would be less than if you used only the small pipe.

(6) L. W. J. asks: What is the amount of sugar in beets? A. Beet juice is commonly estimated to contain from 8 to 10 per cent of sugar, the range being from about 6·5 to 17 per cent.

(7) T. C. D. asks: What kind of machine is used for driving a sand blast for depolishing the surface of glass? A. Any of the small rotary blowers will answer.

(8) E. C. L., referring to the question of E. W. D., page 283, issue of May 4, 1878, writes: The so-called "extra current" probably prevented the telephones from working as well in dry weather as they did on the damp day, for when the wire is a little damp the extra current escapes to a certain extent from the line. If E. W. D. is a practical operator he has no doubt noticed that a wire always works better after a light rain. The telephone, being a more sensitive instrument, is affected so much the more by the condition of the line. If a condenser is used in connection with the telephone it will be found to work well at all times.

(9) W. S. N. asks: What amount of water flow, in gallons, does the miner's inch represent? A. According to some experiments by Professor F. L. Vinton, recently published, the miner's inch is equivalent to a discharge of 0·0254 cubic foot per second.

(10) C. L. G. asks: What is type metal? A. Lead is the chief constituent; antimony is added to compensate for the softness of the lead, and tin to give toughness. Sometimes copper is added in very small percentage to give a still greater degree of tenacity. The proportions used by different makers vary.

In electro-plating, is there a limit in the thickness of the deposited plating beyond which one cannot go? A. None other than the size and efficiency of the apparatus.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

J. N. H.—No. 1 is iron and copper sulphite (chalcopyrite) and impure limonite. No. 2 is iron sulphide (pyrite) in indurated clay.—W. B.—It is globular marcusite—iron 46·4, sulphur 53·3.—W. L. W.—Slate spar—lime carbonate.—J. E. P.—Tourmaline.—W. H. D.—No. 1 is marble veined with pyrites. No. 2 is limonite. No. 3 is specular iron ore. No. 4 is quartz, orthoclase, and pyrite. No. 5 is galenite, of some value. No. 6, pyrite. No. 7, ilmenite. No. 8, gay-lussite. No. 9, phlogophite. No. 10, missing. No. 11, tourmaline. No. 12, quartz. No. 13, barite. The amount of metal in the ores can only be determined by assay.—J. H. S.—The sample of ore sent contains a large percentage of copper and a trace of silver. If the sample is a fair representative of the body of the ore the property is of value.—W. S. L.—Quartz with chalcopyrite (copper-iron sulphide and pyrite). Chalcopyrite is a valuable ore of copper. An assay would be necessary to determine the precise value of the ore.—L. & R. B. N.—It is globular marcusite, containing 46·4 per cent of iron and 53·6 per cent of sulphur.—J. F.—The water contains much iron combined with various organic acids and chlorine. The wood contains tannin, which forms with iron a black stain (ink); hence the darkening of the wood. A little copperas or other neutral salt of iron added to moderately pure water will cause it to impart to the woods mentioned a similar stain under like conditions. The water is of little value for medicinal purposes.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges with much pleasure the receipt of original papers and contributions on the following subjects:

Condensation and Steam Heat. By W. R.

Cinders in the Eye. By E. H. M. and W. S. N.

Mending Boilers. By J. F.

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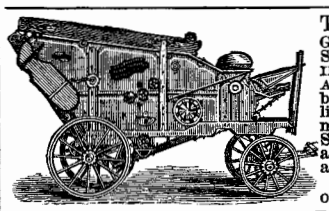

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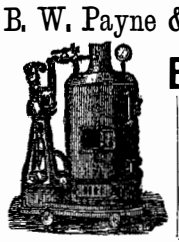

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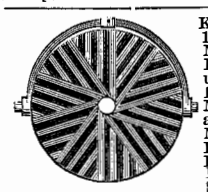

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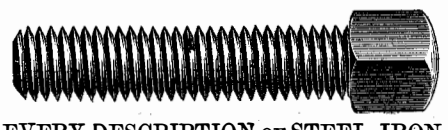

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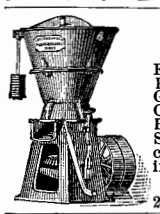

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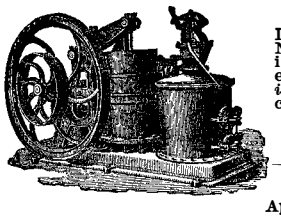

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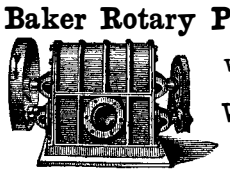

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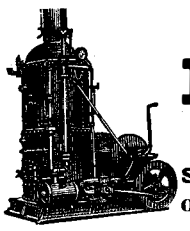

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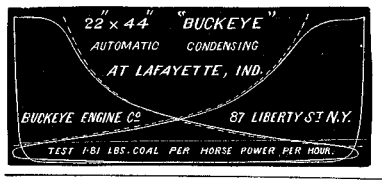
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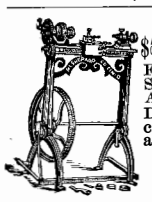

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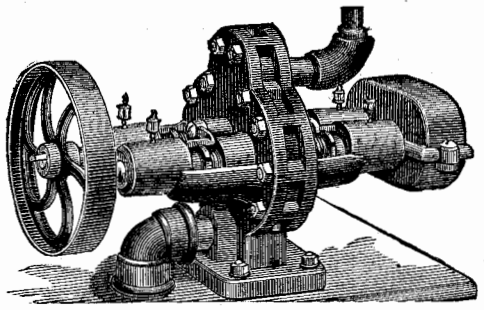

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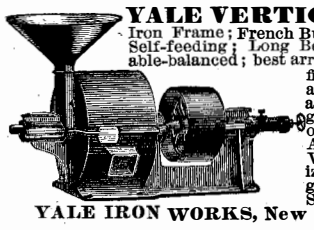

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